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FIG. 1

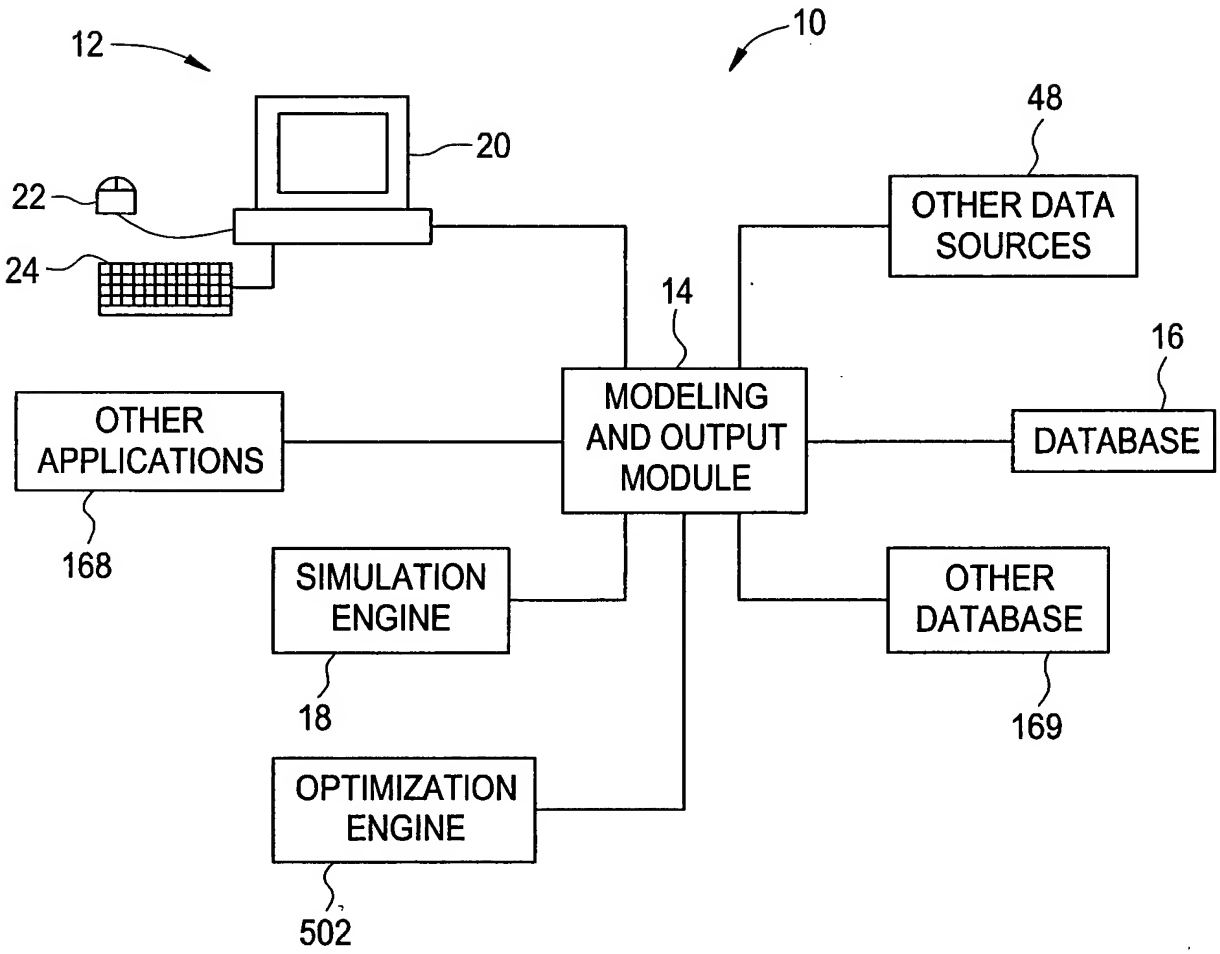


FIG. 2

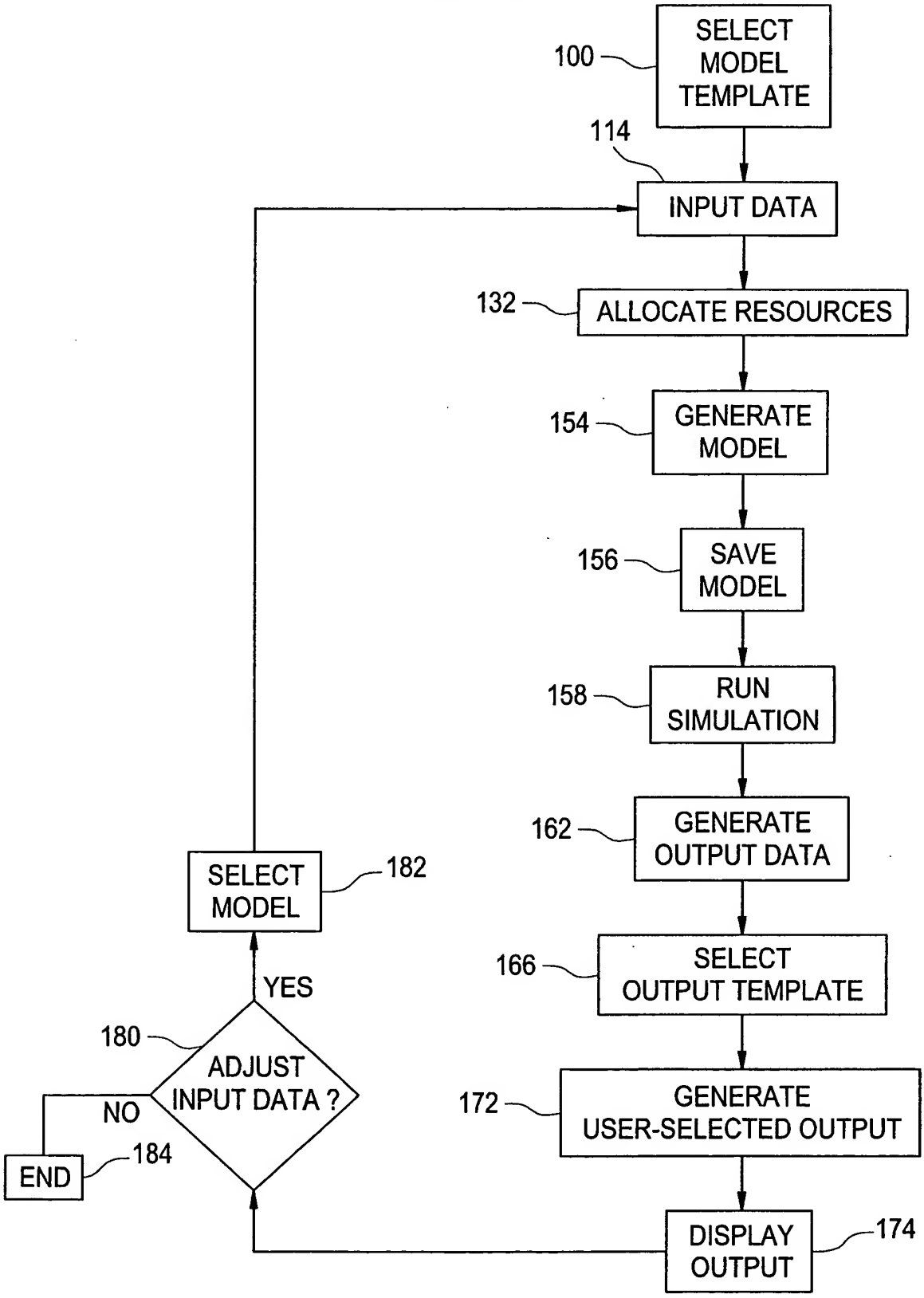
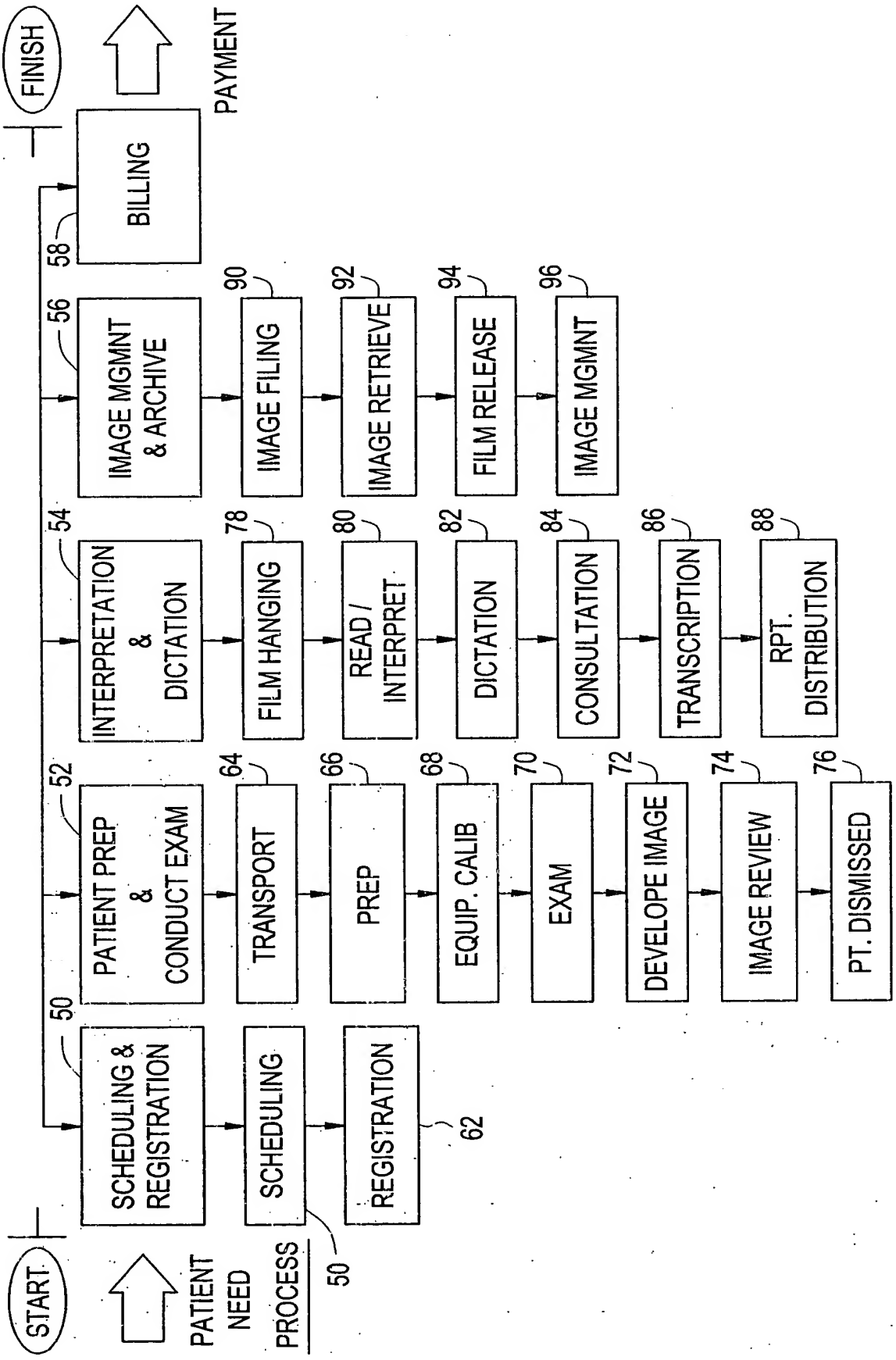

100
SELECT MODEL TEMPLATE
114
INPUT DATA
132
ALLOCATE RESOURCES
154
GENERATE MODEL
156
SAVE MODEL
158
RUN SIMULATION
162
GENERATE OUTPUT DATA
166
SELECT OUTPUT TEMPLATE
172
GENERATE USER-SELECTED OUTPUT
DISPLAY OUTPUT
174
180
ADJUST INPUT DATA ?
YES
NO
182
SELECT MODEL
184
END

FIG. 3


START
PATIENT NEED
PROCESS
50
SCHEDULING & REGISTRATION
50
SCHEDULING
REGISTRATION
62
PATIENT PREP & CONDUCT EXAM
52
TRANSPORT
64
PREP
66
EQUIP. CALIB
68
EXAM
70
DEVELOPE IMAGE
72
IMAGE REVIEW
74
PT. DISMISSED
76
INTERPRETATION & DICTATION
54
FILM HANGING
78
READ / INTERPRET
80
DICTATION
82
CONSULTATION
84
TRANSCRIPTION
86
RPT. DISTRIBUTION
88
IMAGE MGMNT & ARCHIVE
56
IMAGE FILING
90
IMAGE RETRIEVE
92
FILM RELEASE
94
IMAGE MGMNT
96
BILLING
58
PAYMENT
FINISH

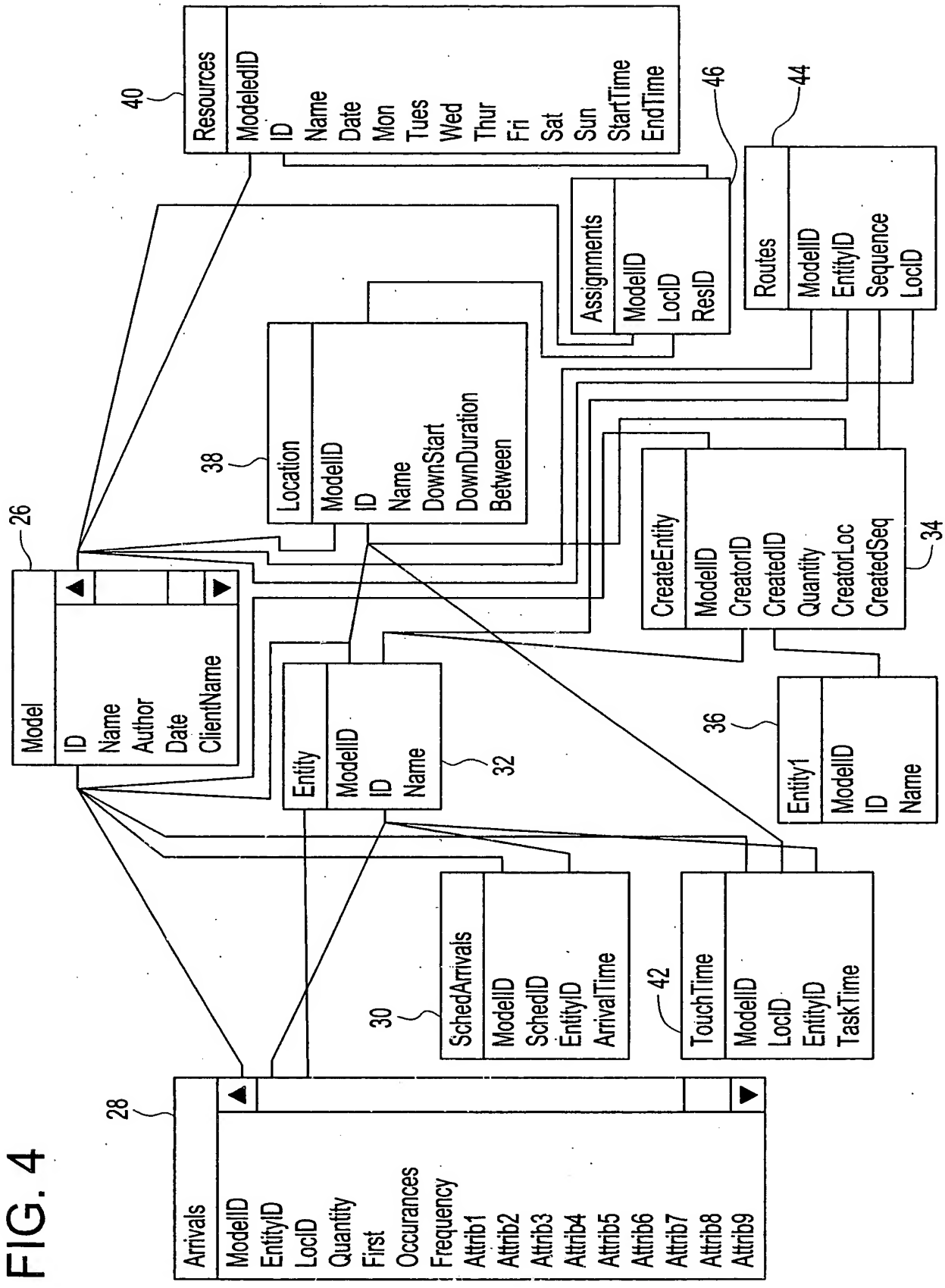

Resources
ModeledID
ID
Name
Date
Mon
Tues
Wed
Thur
Fri
Sat
Sun
StartTime
EndTime
40
Assignments
ModelID
LocID
ResID
46
Routes
ModelID
EntityID
Sequence
LocID
44
Location
ModelID
ID
Name
DownStart
DownDuration
Between
38
Model
ID
Name
Author
Date
ClientName
26
CreateEntity
ModelID
CreatorID
CreatedID
Quantity
CreatorLoc
CreatedSeq
34
Entity
ModelID
ID
Name
32
Entity1
ModelID
ID
Name
36
SchedArrivals
ModelID
SchedID
EntityID
ArrivalTime
30
TouchTime
ModelID
LocID
EntityID
TaskTime
42
Arrivals
ModelID
EntityID
LocID
Quantity
First
Occurances
Frequency
Attrib1
Attrib2
Attrib3
Attrib4
Attrib5
Attrib6
Attrib7
Attrib8
Attrib9
28

FIG. 4

FIG. 5

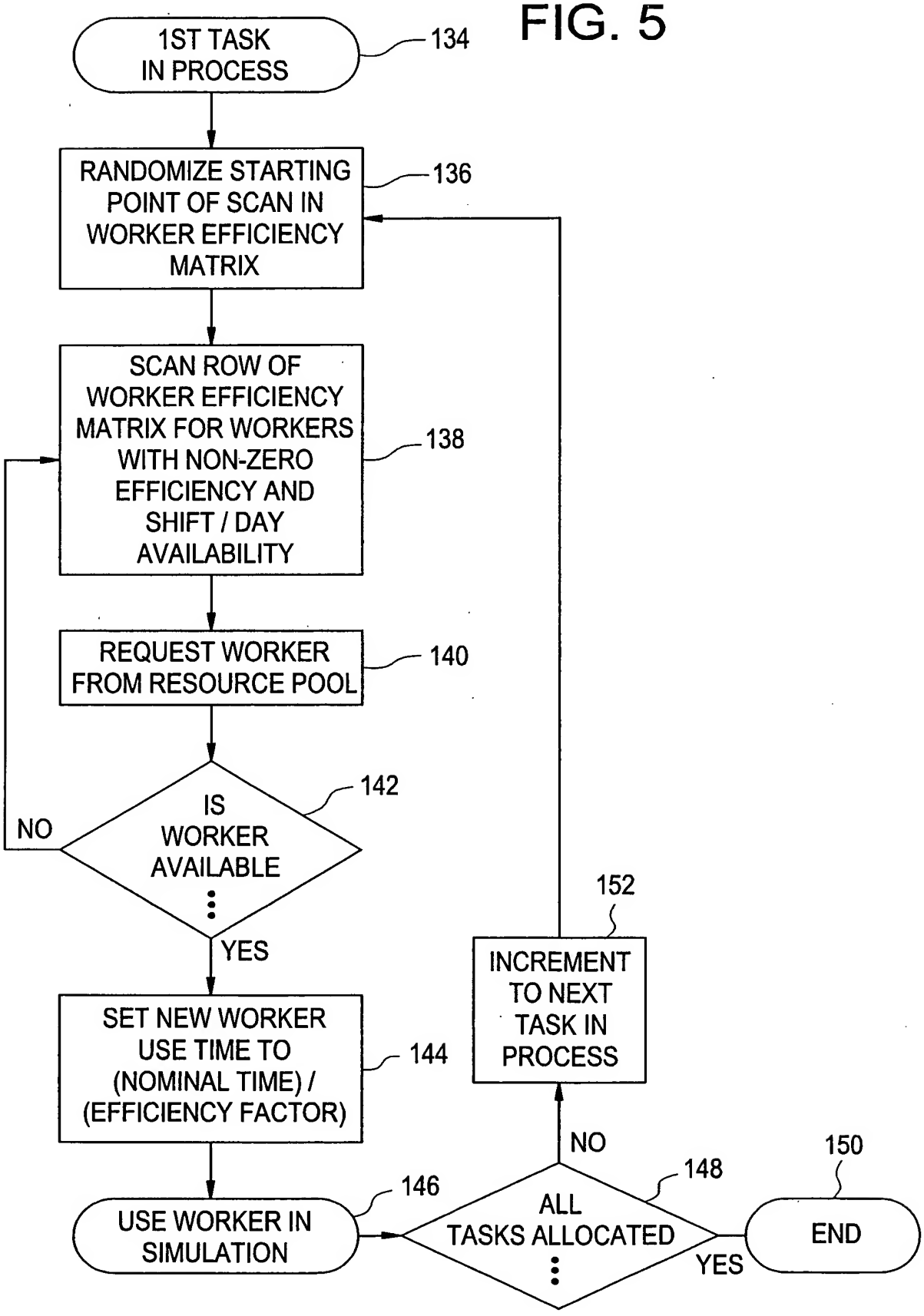

1ST TASK IN PROCESS
134
RANDOMIZE STARTING POINT OF SCAN IN WORKER EFFICIENCY MATRIX
136
SCAN ROW OF WORKER EFFICIENCY MATRIX FOR WORKERS WITH NON-ZERO EFFICIENCY AND SHIFT / DAY AVAILABILITY
138
REQUEST WORKER FROM RESOURCE POOL
140
IS WORKER AVAILABLE
142
NO
YES
SET NEW WORKER USE TIME TO (NOMINAL TIME) / (EFFICIENCY FACTOR)
144
USE WORKER IN SIMULATION
146
ALL TASKS ALLOCATED
148
NO
YES
INCREMENT TO NEXT TASK IN PROCESS
152
END
150

FIG. 6

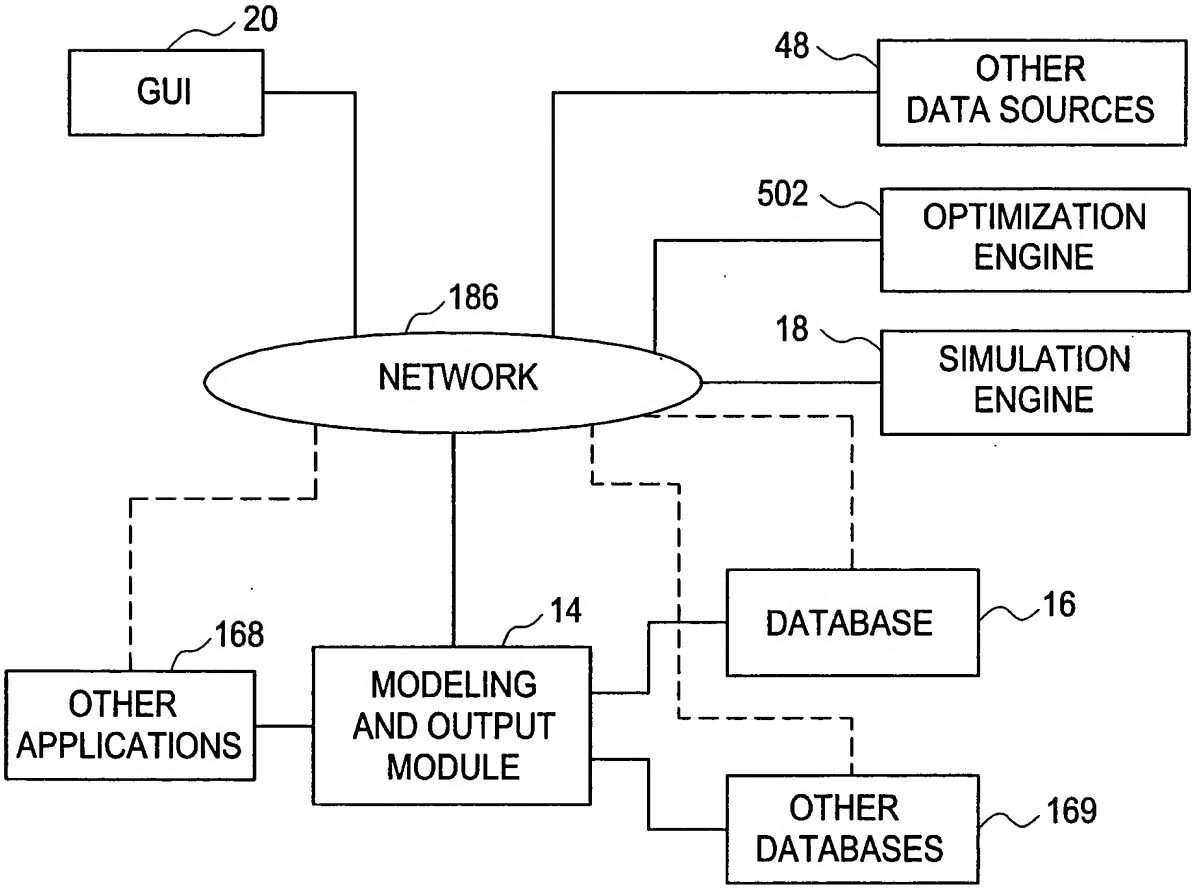

20
GUI
48
OTHER
DATA SOURCES
502
OPTIMIZATION
ENGINE
186
NETWORK
18
SIMULATION
ENGINE
168
OTHER
APPLICATIONS
14
MODELING
AND OUTPUT
MODULE
DATABASE
16
OTHER
DATABASES
169

FIG. 7

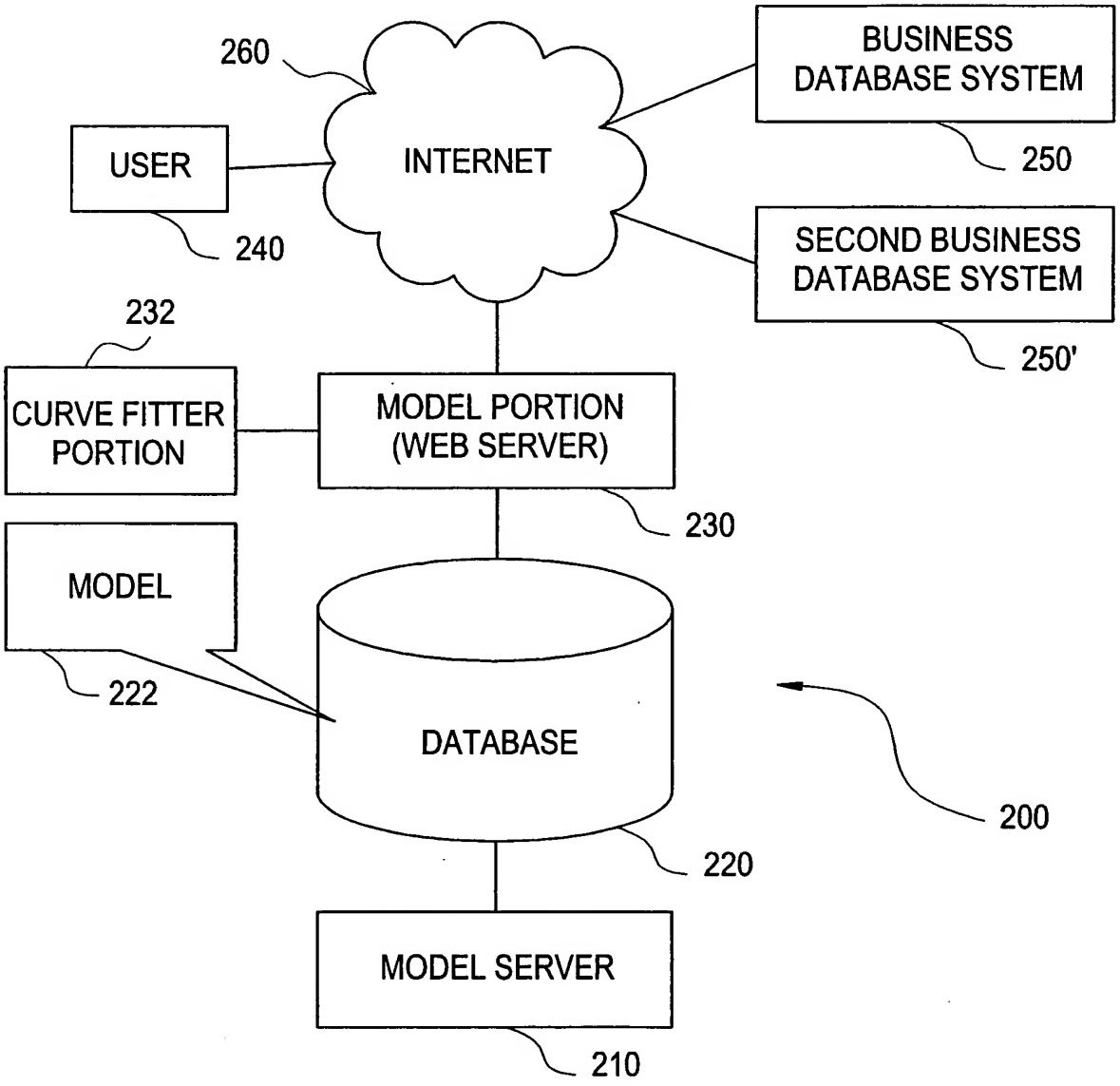
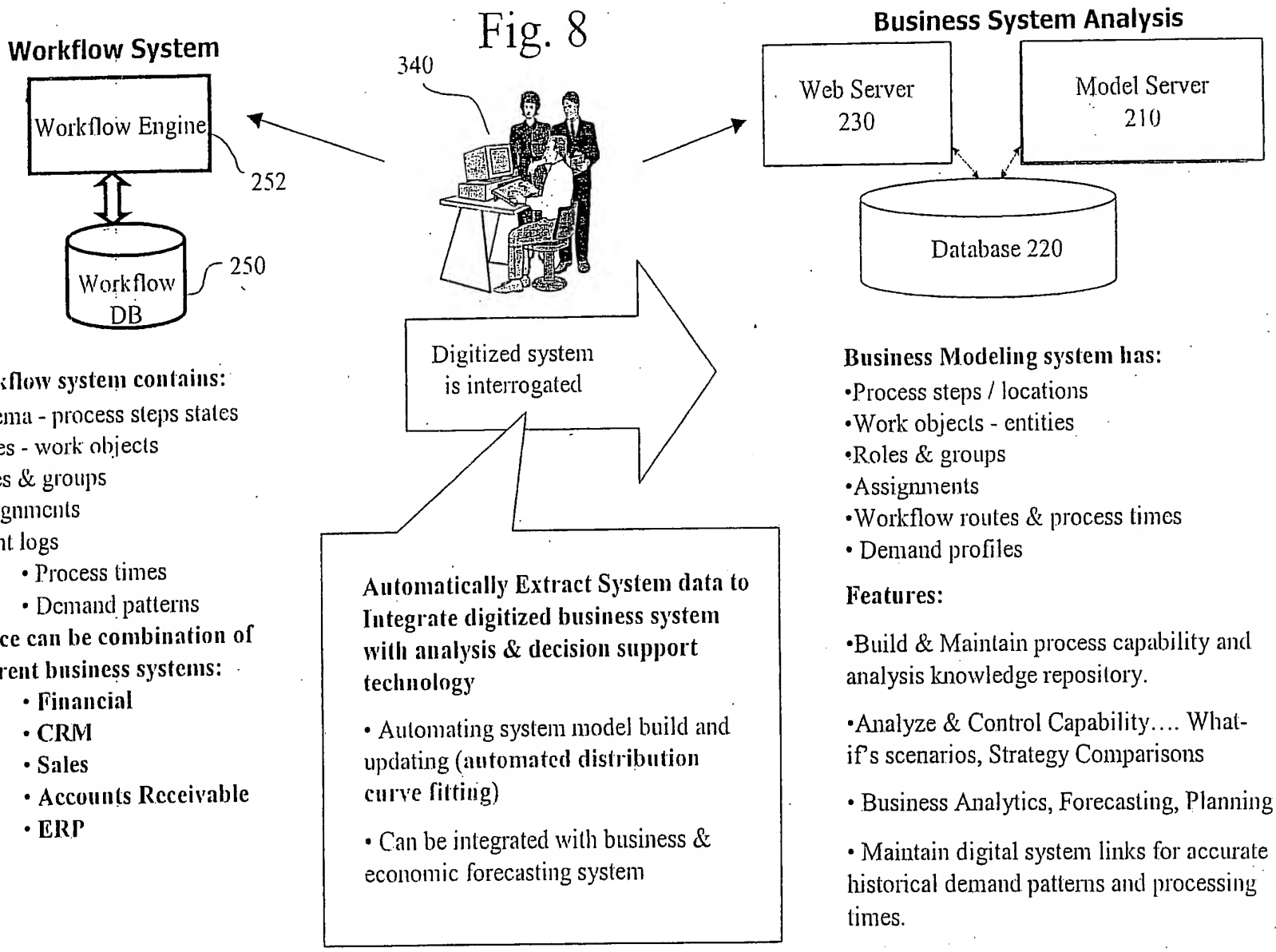

260
INTERNET
BUSINESS DATABASE SYSTEM
250
USER
240
SECOND BUSINESS DATABASE SYSTEM
250'
232
CURVE FITTER PORTION
MODEL PORTION (WEB SERVER)
230
MODEL
222
DATABASE
200
220
MODEL SERVER
210

Fig. 8


Workflow System
Workflow Engine
252
Workflow DB
250
340
Digitized system is interrogated
Business System Analysis
Web Server 230
Model Server 210
Database 220
Workflow system contains:
•Schema - process steps states
•Types - work objects
•Roles & groups
•Assignments
•Event logs
• Process times
• Demand patterns
Source can be combination of different business systems:
• Financial
• CRM
• Sales
• Accounts Receivable
• ERP
Automatically Extract System data to Integrate digitized business system with analysis & decision support technology
• Automating system model build and updating (automated distribution curve fitting)
• Can be integrated with business & economic forecasting system
Business Modeling system has:
•Process steps / locations
•Work objects - entities
•Roles & groups
•Assignments
•Workflow routes & process times
• Demand profiles
Features:
•Build & Maintain process capability and analysis knowledge repository.
•Analyze & Control Capability…. What-if's scenarios, Strategy Comparisons
• Business Analytics, Forecasting, Planning
• Maintain digital system links for accurate historical demand patterns and processing times.

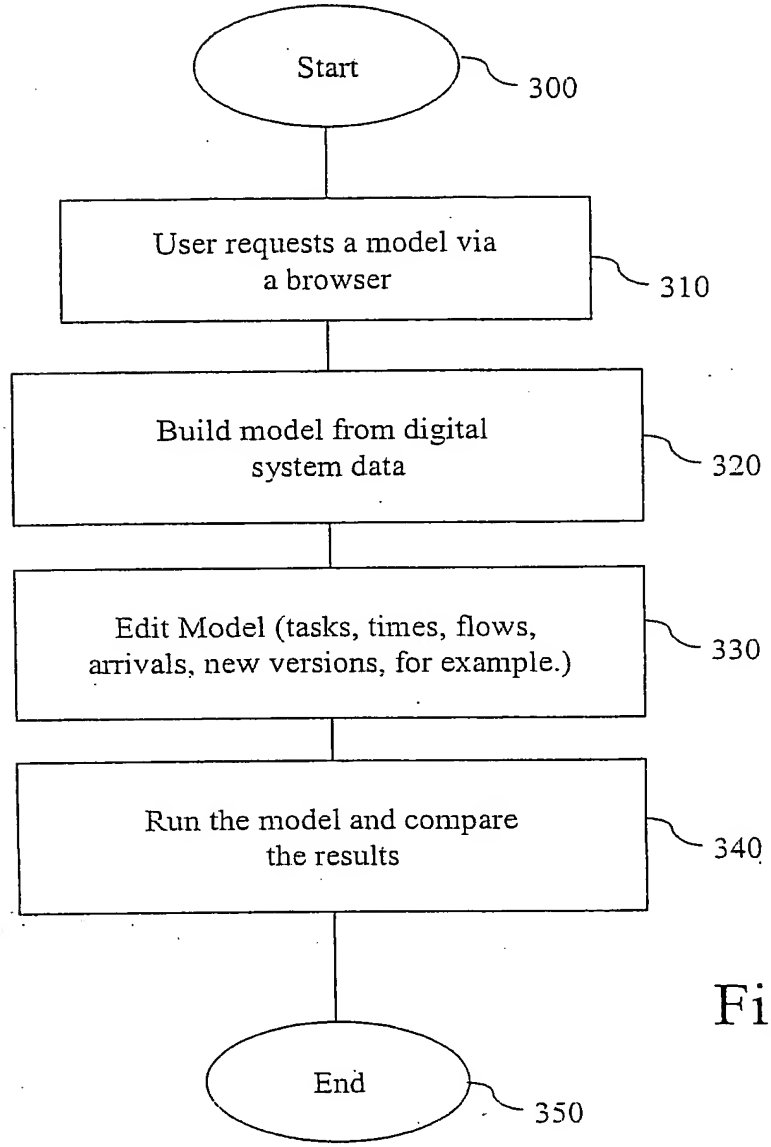

Start
300
User requests a model via a browser
310
Build model from digital system data
320
Edit Model (tasks, times, flows, arrivals, new versions, for example.)
330
Run the model and compare the results
340
End
350

Fig. 9

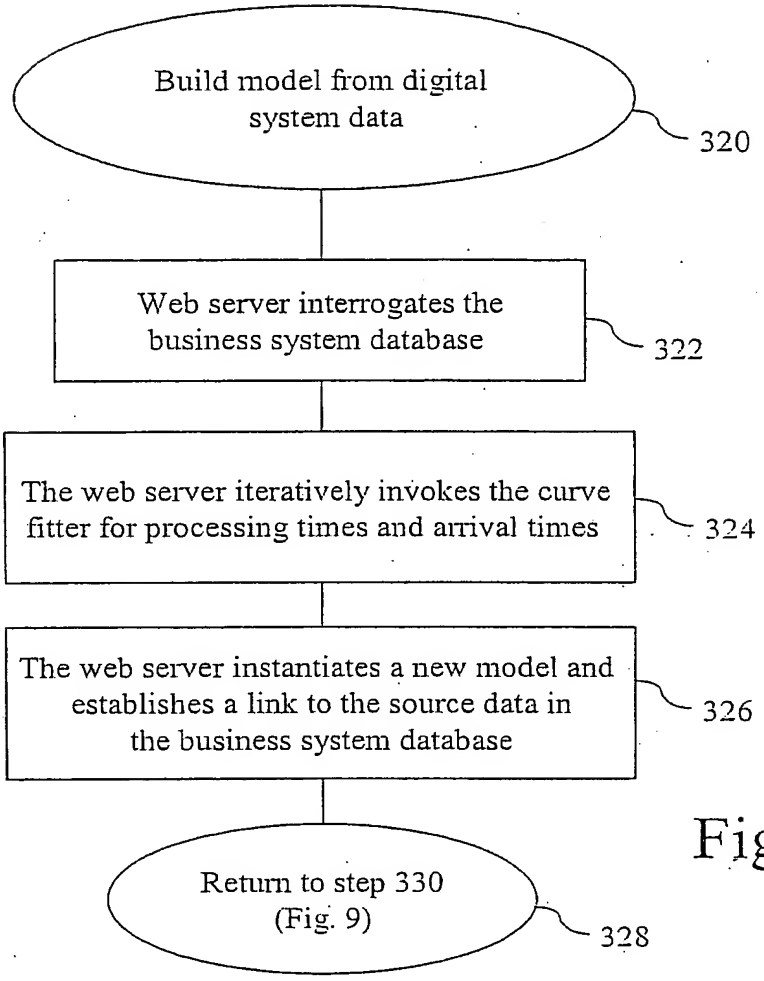

Build model from digital system data
320
Web server interrogates the business system database
322
The web server iteratively invokes the curve fitter for processing times and arrival times
324
The web server instantiates a new model and establishes a link to the source data in the business system database
326
Return to step 330 (Fig. 9)
328

Fig. 10

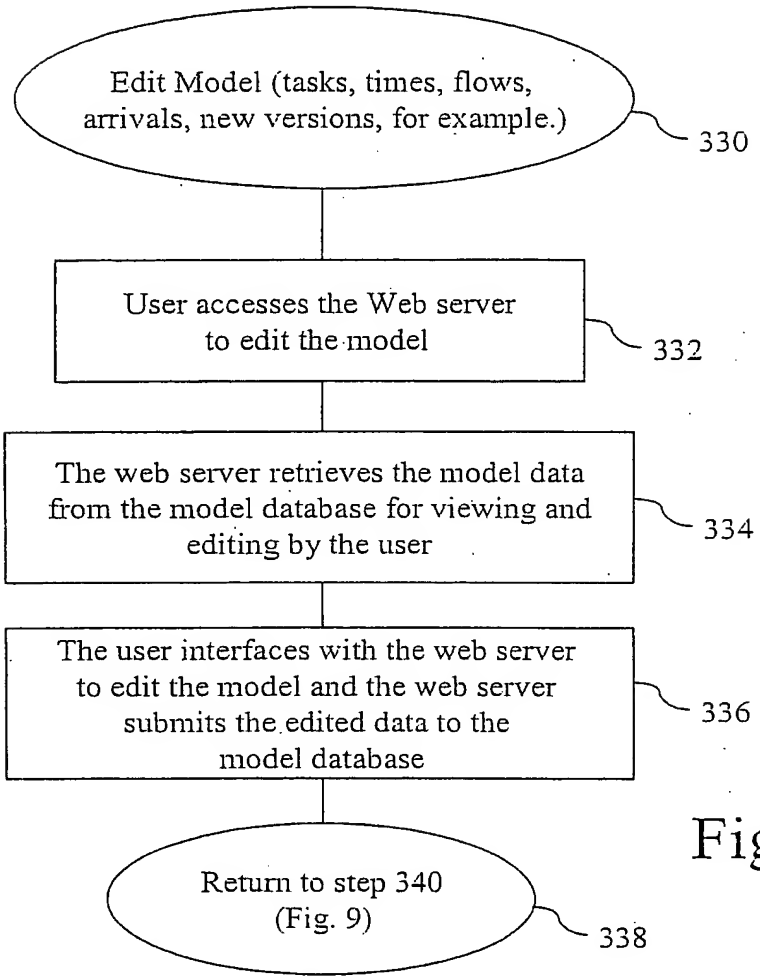

Edit Model (tasks, times, flows, arrivals, new versions, for example.)
330
User accesses the Web server to edit the model
332
The web server retrieves the model data from the model database for viewing and editing by the user
334
The user interfaces with the web server to edit the model and the web server submits the edited data to the model database
336
Return to step 340 (Fig. 9)
338

Fig. 11

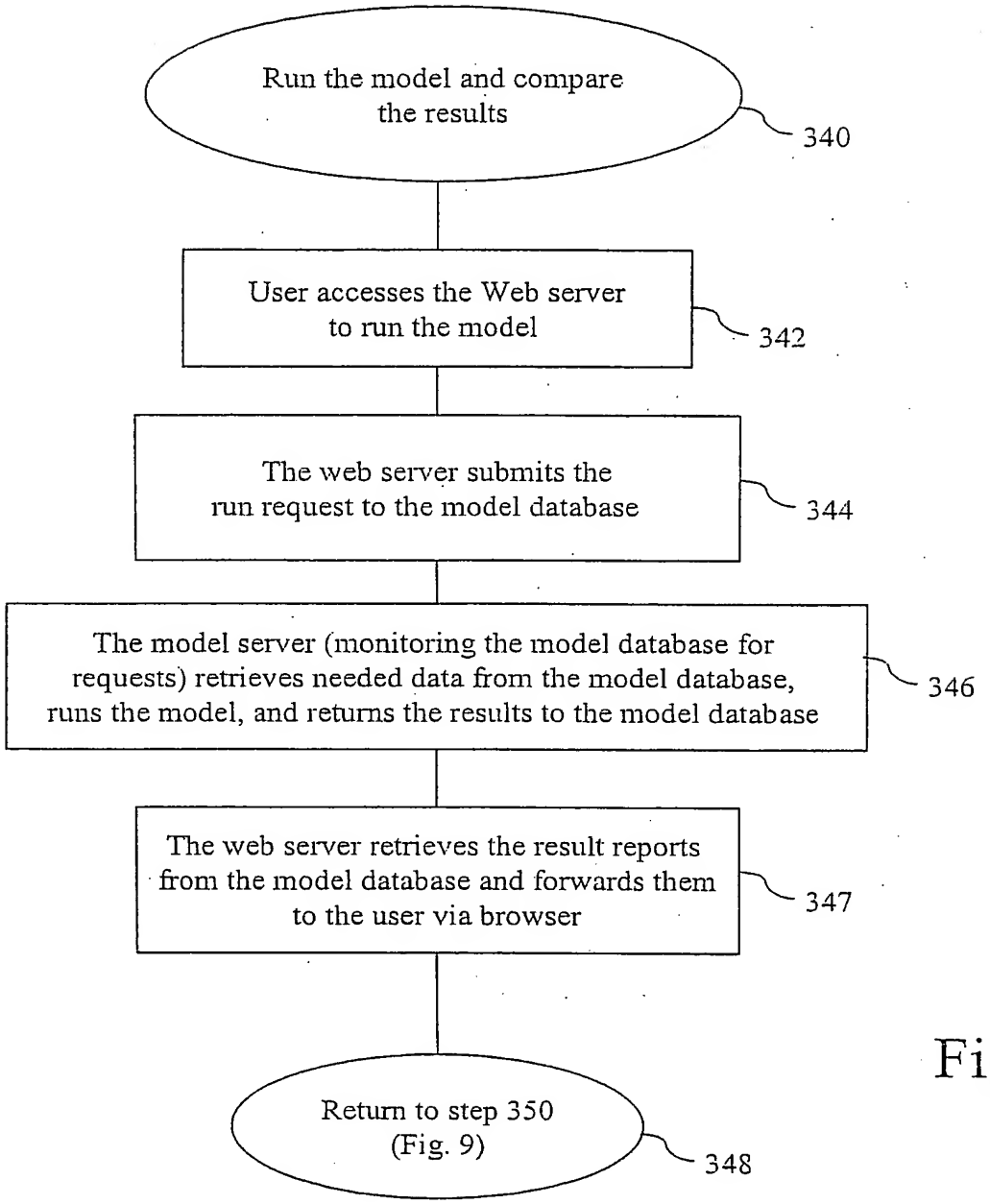

Run the model and compare the results
340
User accesses the Web server to run the model
342
The web server submits the run request to the model database
344
The model server (monitoring the model database for requests) retrieves needed data from the model database, runs the model, and returns the results to the model database
346
The web server retrieves the result reports from the model database and forwards them to the user via browser
347
Return to step 350 (Fig. 9)
348

Fig. 12

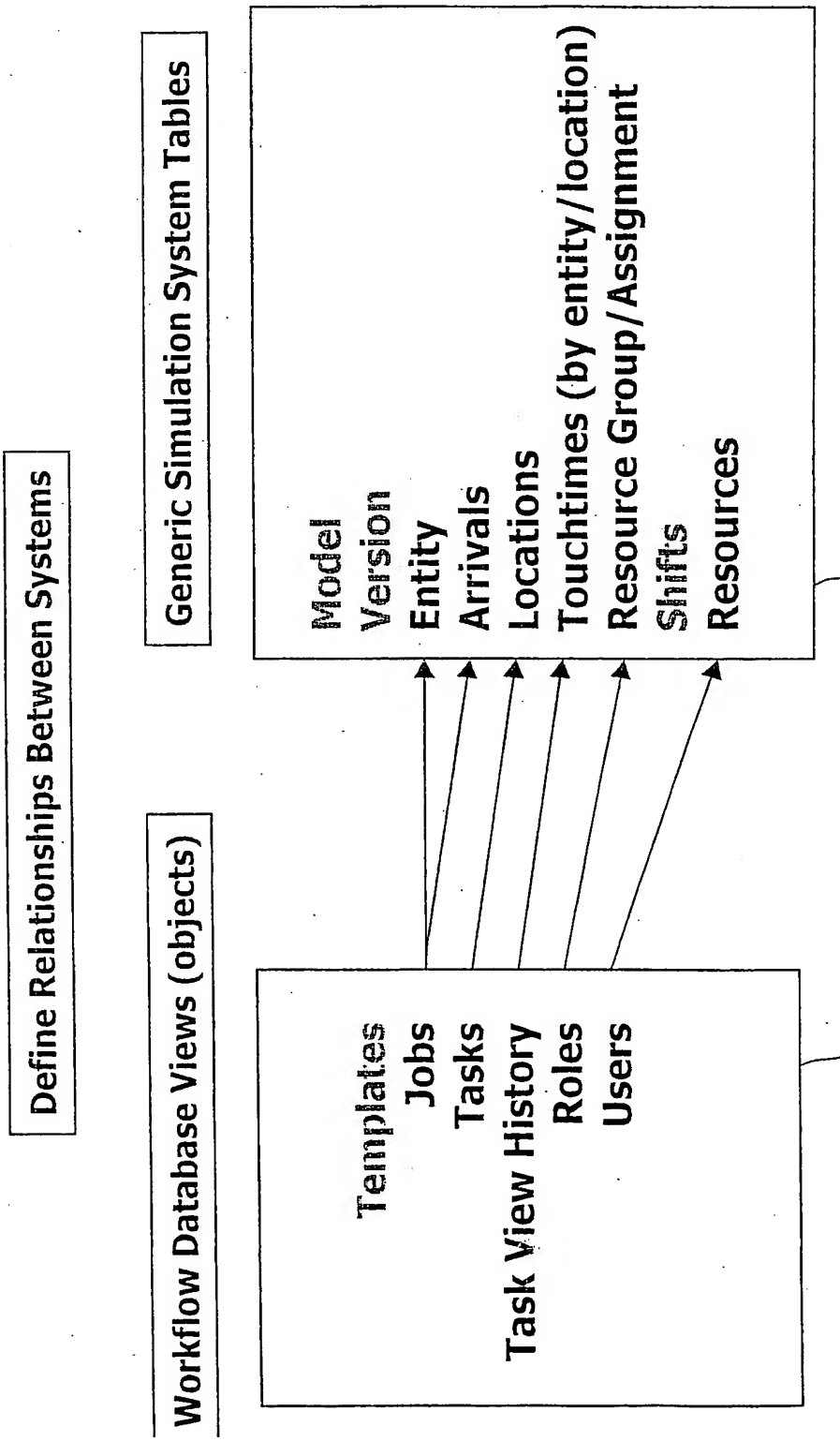

Define Relationships Between Systems
Workflow Database Views (objects)
Templates
Jobs
Tasks
Task View History
Roles
Users
254
Generic Simulation System Tables
Model
Version
Entity
Arrivals
Locations
Touchtimes (by entity/location)
Resource Group/Assignment
Shifts
Resources
224

Fig. 13

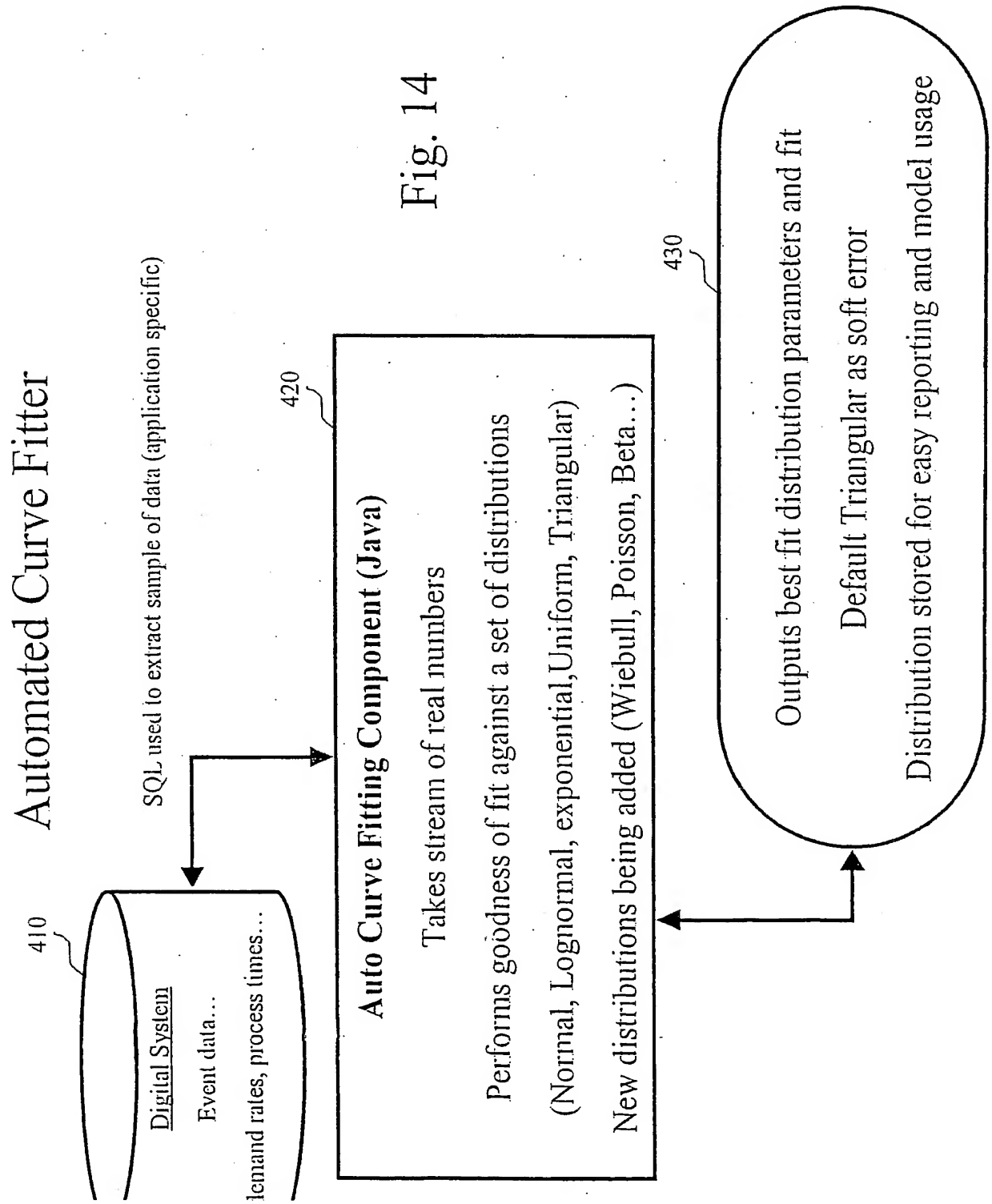

Automated Curve Fitter
410
Digital System
Event data…
Demand rates, process times…
SQL used to extract sample of data (application specific)
420
Auto Curve Fitting Component (Java)
Takes stream of real numbers
Performs goodness of fit against a set of distributions
(Normal, Lognormal, exponential,Uniform, Triangular)
New distributions being added (Wiebull, Poisson, Beta…)
430
Outputs best fit distribution parameters and fit
Default Triangular as soft error
Distribution stored for easy reporting and model usage

Fig. 14

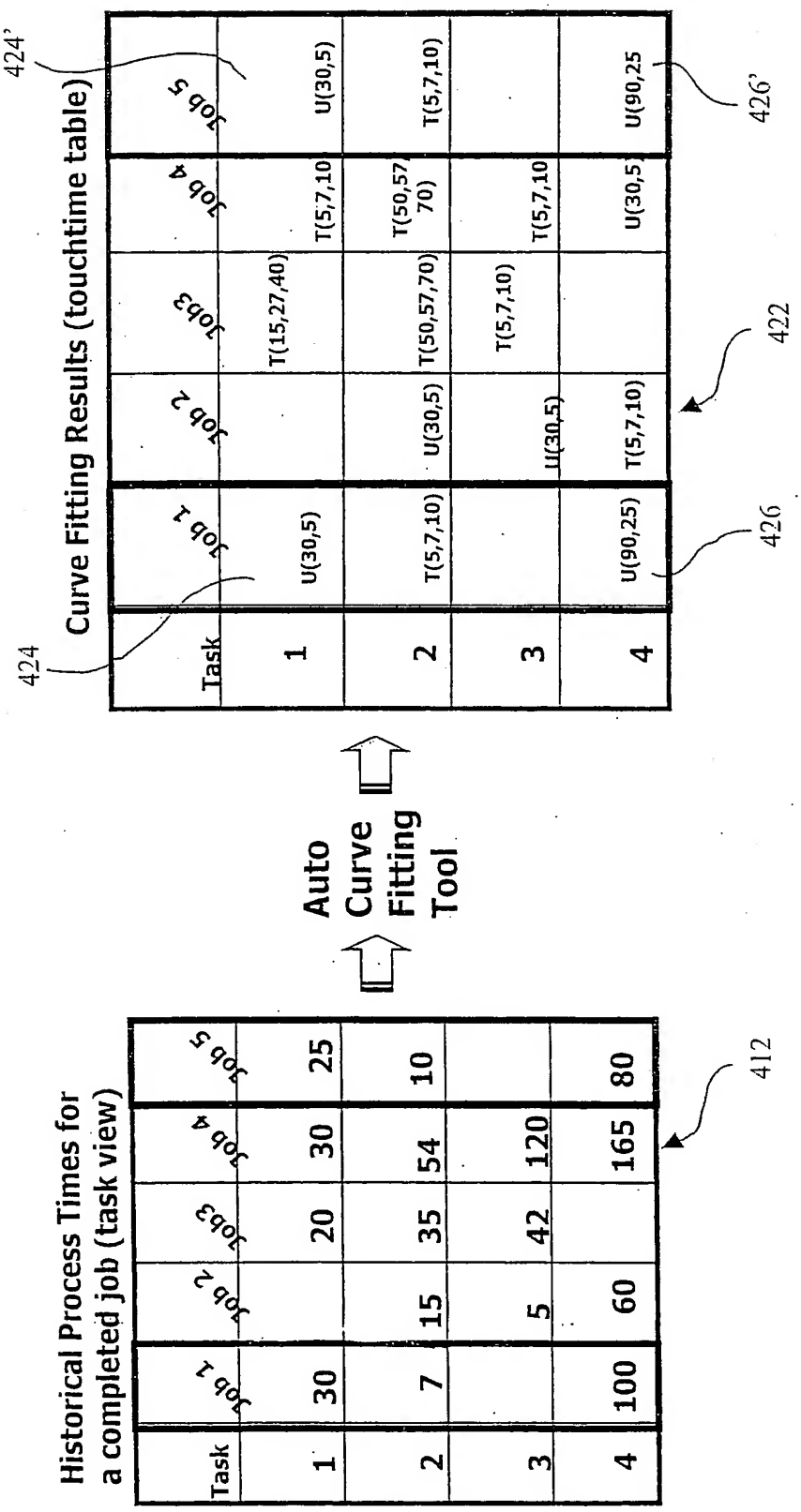

Historical Process Times for a completed job (task view)
Task
Job 1
Job 2
Job 3
Job 4
Job 5
1
30
2
7
15
20
30
25
3
5
42
120
4
100
60
165
80
412
Auto Curve Fitting Tool
Curve Fitting Results (touchtime table)
424'
424
426'
426
422
U(30,5)
T(5,7,10)
T(15,27,40)
T(50,57,70)
U(90,25)

Fig. 15

Process steps 310, 332, 342

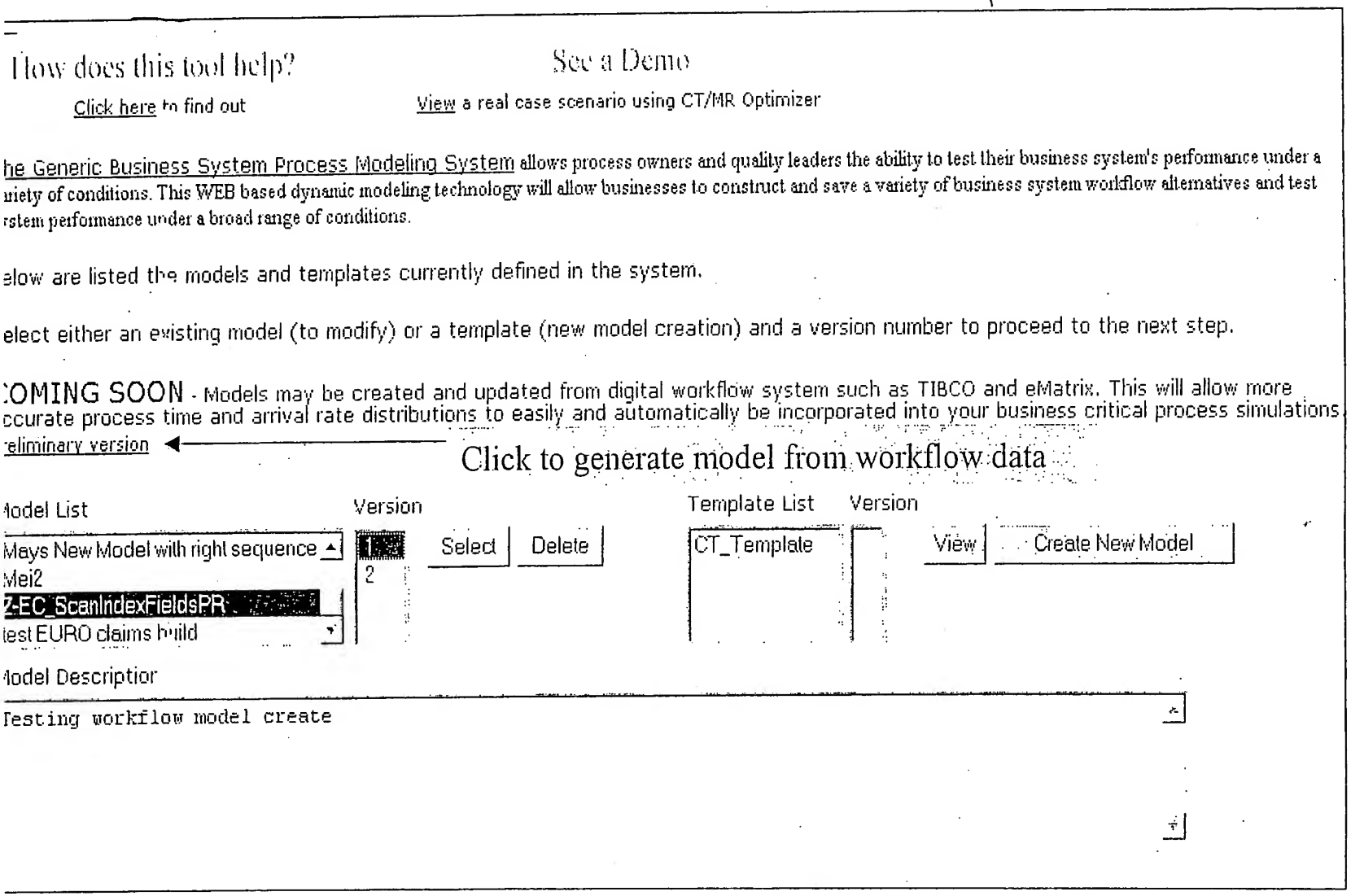


Fig. 16

Auto Generate a process model based on historical workflow data

Generated list of workflow

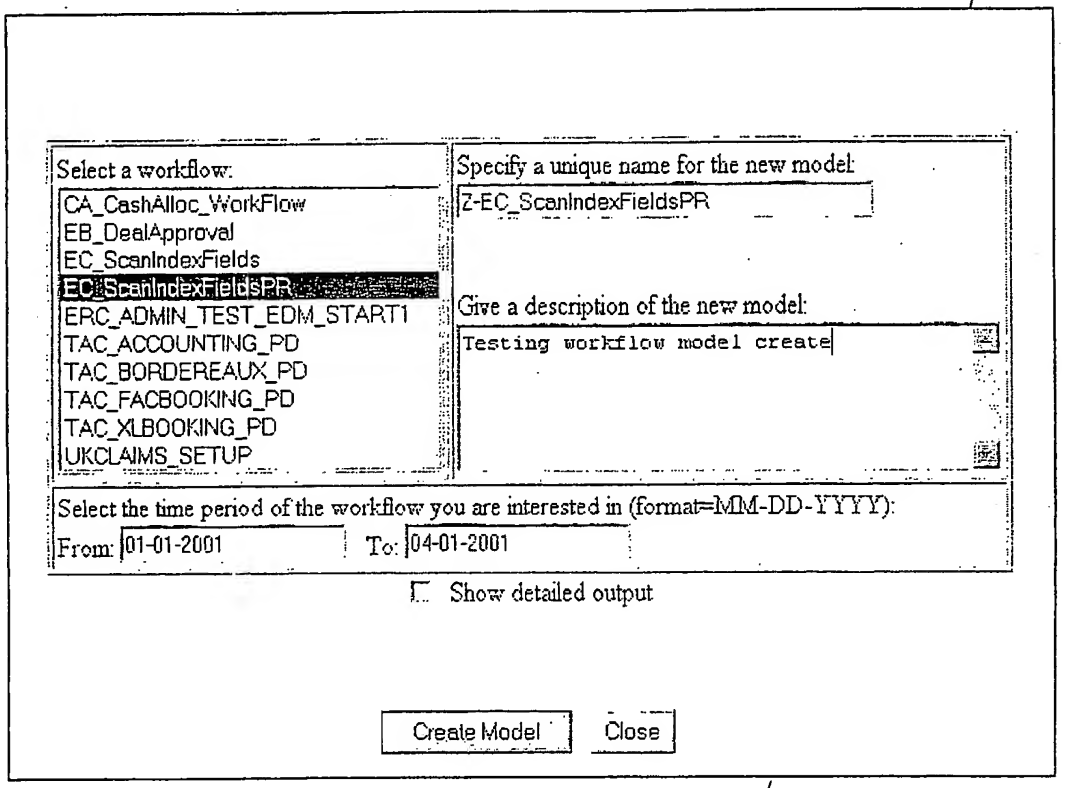
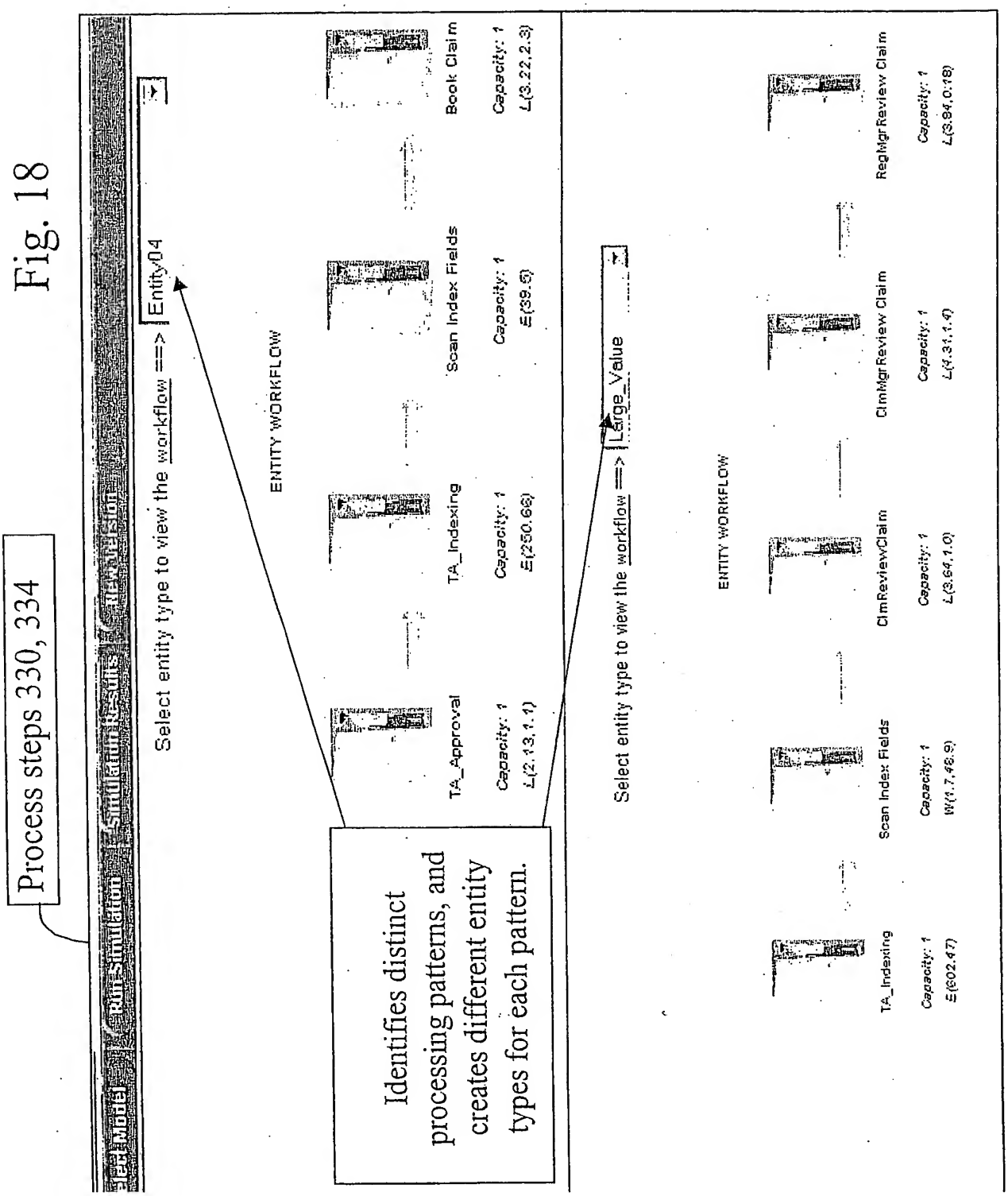


Fig. 17

Process step 320

Fig. 18


Process steps 330, 334
Select entity type to view the workflow ==> Entity04
ENTITY WORKFLOW
TA_Approval
Capacity: 1
E(250.66)
TA_Indexing
Capacity: 1
E(39.6)
Scan Index Fields
Capacity: 1
E(3.22,2.3)
Book Claim
Identifies distinct processing patterns, and creates different entity types for each pattern.
Select entity type to view the workflow ==> Large_Value
ENTITY WORKFLOW
TA_Indexing
Capacity: 1
E(602.47)
Scan Index Fields
Capacity: 1
W(1.7,48.9)
ClmReviewClaim
Capacity: 1
L(3.64,1.0)
ClmMgrReview Claim
Capacity: 1
L(4.31,1.4)
RegMgrReview Claim
Capacity: 1
L(3.84,0.18)

Model elements can easily be added and edited

Model Id	Model Name	Version
211	Z-EC_ScanIndexFieldsPR	1

Model information page; Only name, version number and description can be updated using this page. This page should be accessible from any point in the modeling process. This page should appear when a model is loaded from the database. You can select models from the database.

Model name:	Z-EC_ScanIndexFields	Version number:	1
Number of entities	8	Number of arrivals	0
Number of resources	0	Number of resource groups	0
Number of process steps	10	Number of assignments.	0
Number of workflows	32	Last modified Scheduled Arrivals	

You can edit the model description or create another model using this model as a starting point or template by changing the name or version number and pressing the update button. This will create a new instance of the model that you can make changes to while saving the current model for future reference.

Model description: Testing workflow model create

Update | Done

Process step 336

Fig. 19

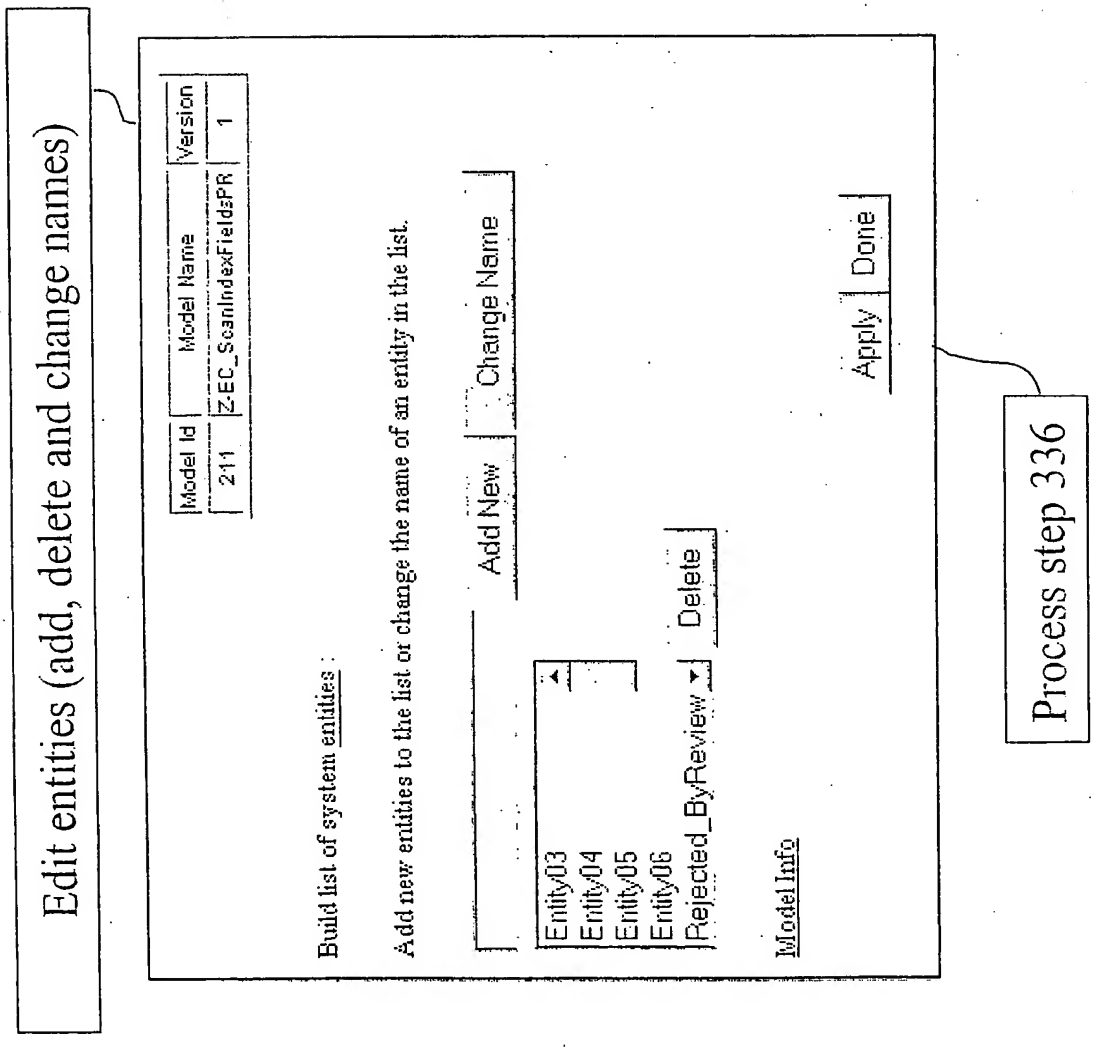

Edit entities (add, delete and change names)
Model Id
Model Name
Version
211
Z-EC_ScanIndexFieldsPR
1
Build list of system entities :
Add new entities to the list or change the name of an entity in the list.
Add New
Change Name
Entity03
Entity04
Entity05
Entity06
Rejected_ByReview
Delete
Model Info
Apply
Done
Process step 336

Fig. 20

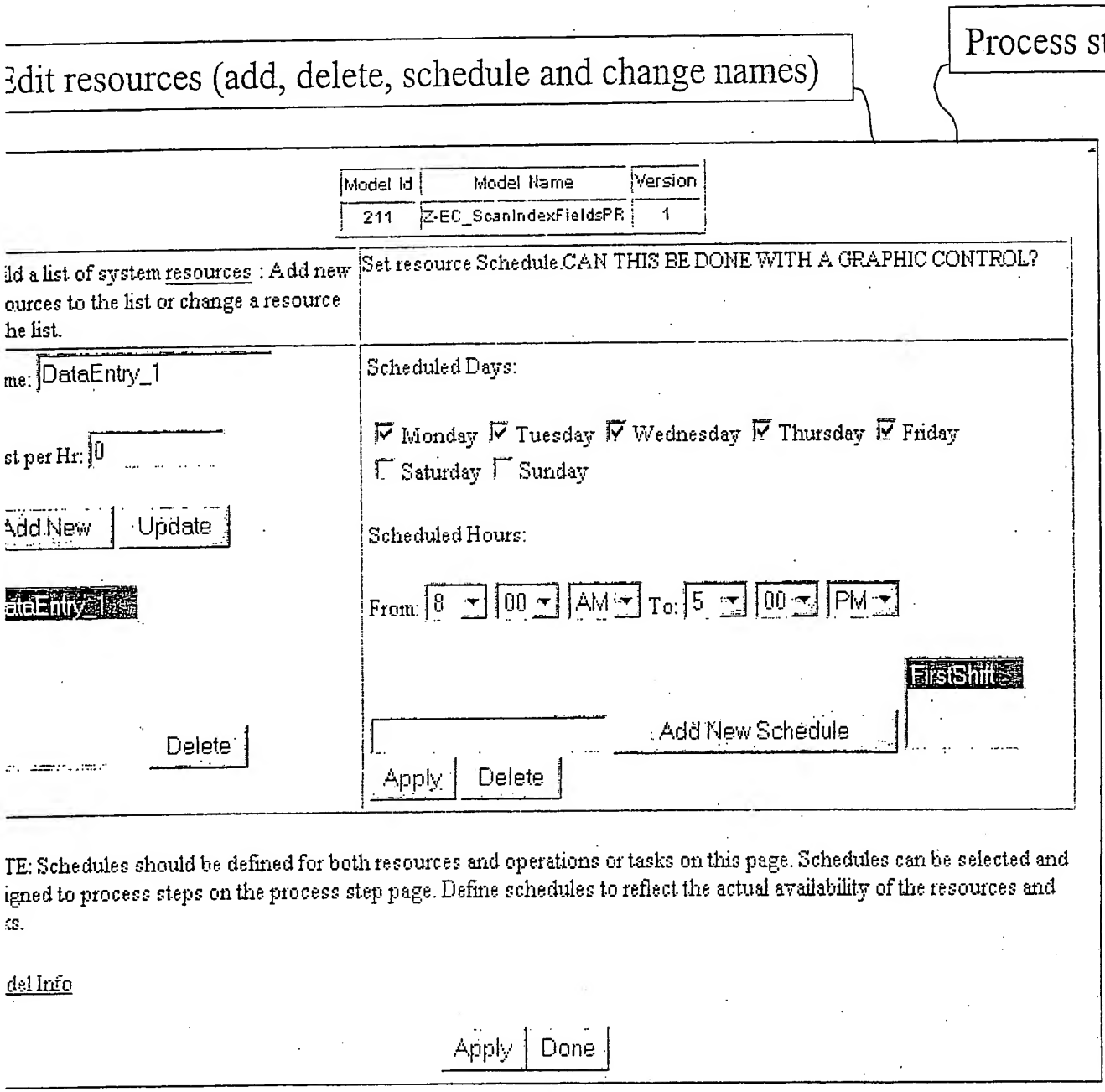

Process step 336
Edit resources (add, delete, schedule and change names)
Model Id
Model Name
Version
211
Z-EC_ScanIndexFieldsPR
1
ld a list of system resources : Add new ources to the list or change a resource he list.
Set resource Schedule.CAN THIS BE DONE WITH A GRAPHIC CONTROL?
me: DataEntry_1
st per Hr: 0
Add New
Update
ataEntry_1
Delete
Scheduled Days:
Monday Tuesday Wednesday Thursday Friday
Saturday Sunday
Scheduled Hours:
From: 8 00 AM To: 5 00 PM
FirstShift
Add New Schedule
Apply
Delete
TE: Schedules should be defined for both resources and operations or tasks on this page. Schedules can be selected and igned to process steps on the process step page. Define schedules to reflect the actual availability of the resources and ts.
del Info
Apply
Done

Fig. 21

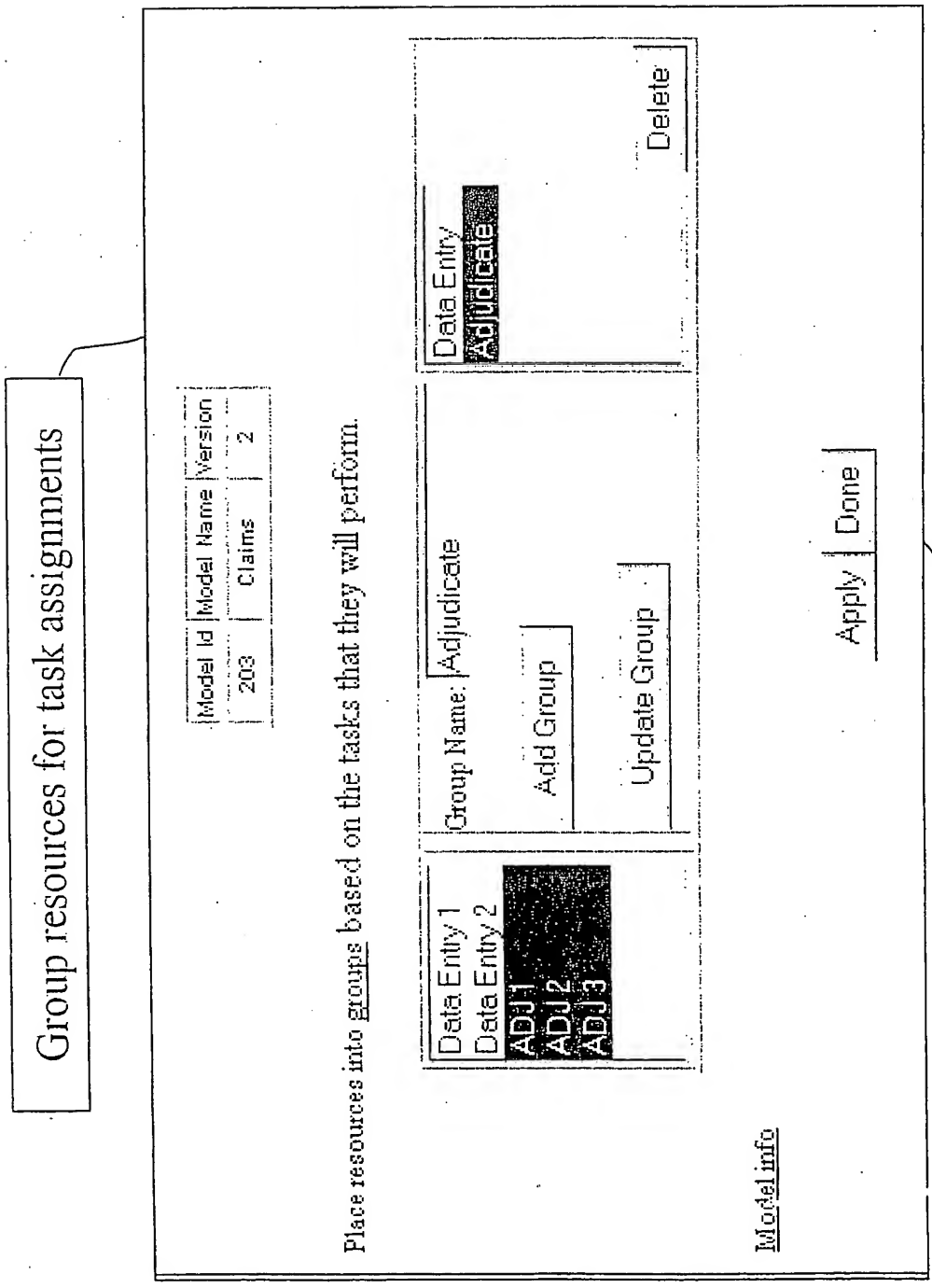

Group resources for task assignments
Model Id
Model Name
Version
203
Claims
2
Place resources into groups based on the tasks that they will perform.
Data Entry 1
Data Entry 2
ADJ 1
ADJ 2
ADJ 3
Group Name: Adjudicate
Add Group
Update Group
Data Entry
Adjudicate
Delete
Model info
Apply
Done
Process step 336

Fig. 22

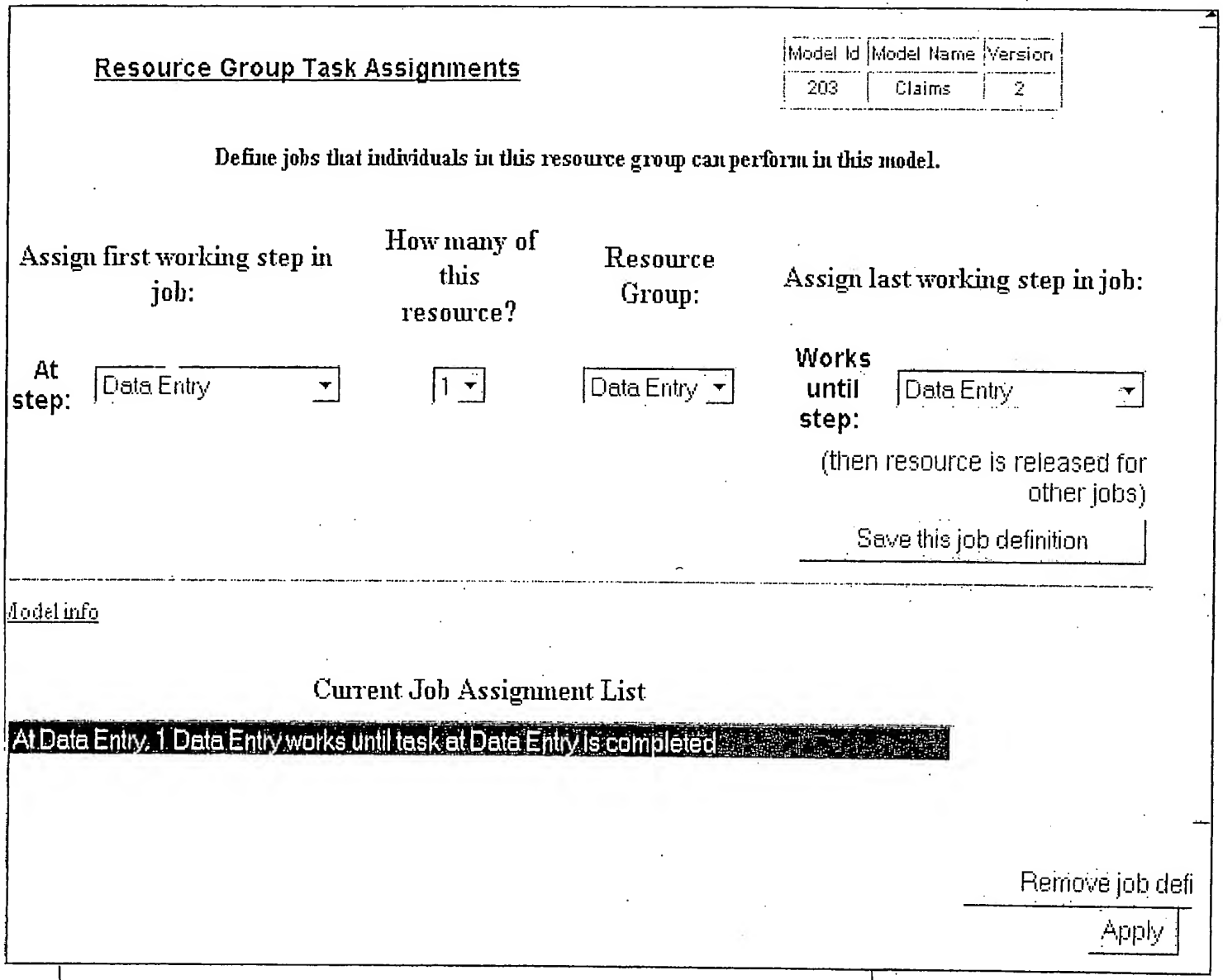

Resource Group Task Assignments
Model Id
Model Name
Version
203
Claims
2
Define jobs that individuals in this resource group can perform in this model.
Assign first working step in job:
How many of this resource?
Resource Group:
Assign last working step in job:
At step:
Data Entry
1
Data Entry
Works until step:
Data Entry
(then resource is released for other jobs)
Save this job definition
Model info
Current Job Assignment List
At Data Entry, 1 Data Entry works until task at Data Entry is completed
Remove job defi
Apply
Group resources for task assignments
Process step 336

Fig. 23

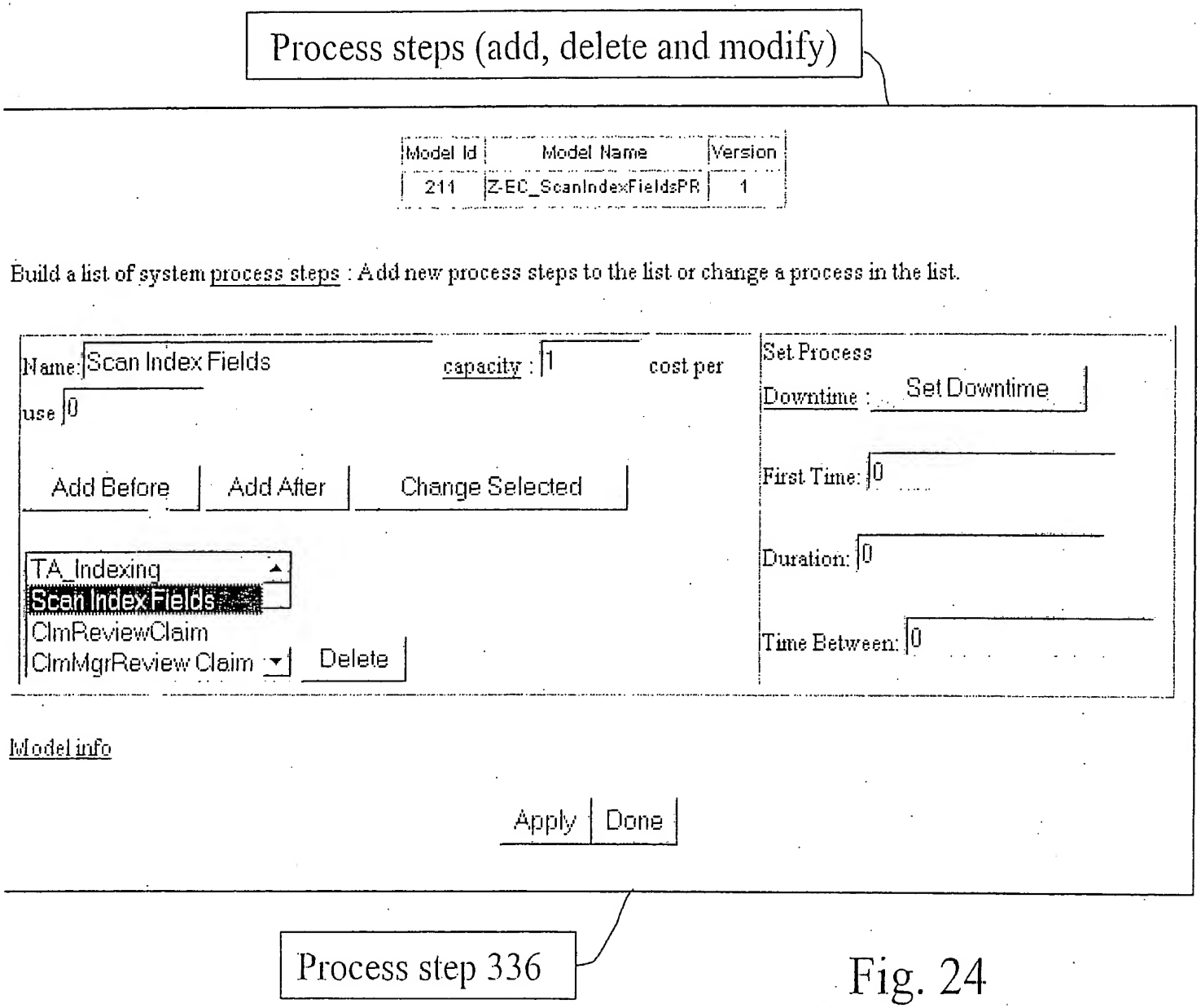

Process steps (add, delete and modify)
Model Id
Model Name
Version
211
Z-EC_ScanIndexFieldsPR
1
Build a list of system process steps : Add new process steps to the list or change a process in the list.
Name: Scan Index Fields
capacity : 1
cost per use 0
Add Before
Add After
Change Selected
TA_Indexing
Scan Index Fields
ClmReviewClaim
ClmMgrReview Claim
Delete
Set Process
Downtime : Set Downtime
First Time: 0
Duration: 0
Time Between: 0
Model info
Apply
Done
Process step 336

Fig. 24

Change arrival patterns (Number & frequency)

Model Id	Model Name	Version
203	Claims	2

Arrivals describe the entry pattern of entities into the business process from an external source.

Entity	Arrives at Process Step	Qty. Each	First Time	Occurances	Frequency
SL Claim	Arrival_Q				

Add Arrival | Update | Del Arrival

SL Claim At Arrival_Q 15 0 INF 168 HR
SL Claim At Arrival_Q 15 24 INF 168 HR
SL Claim At Arrival_Q 15 48 INF 168 HR
SL Claim At Arrival_Q 15 72 INF 168 HR
SL Claim At Arrival_Q 15 96 INF 168 HR

Model info

Apply | Done

Process step 336

Fig. 25

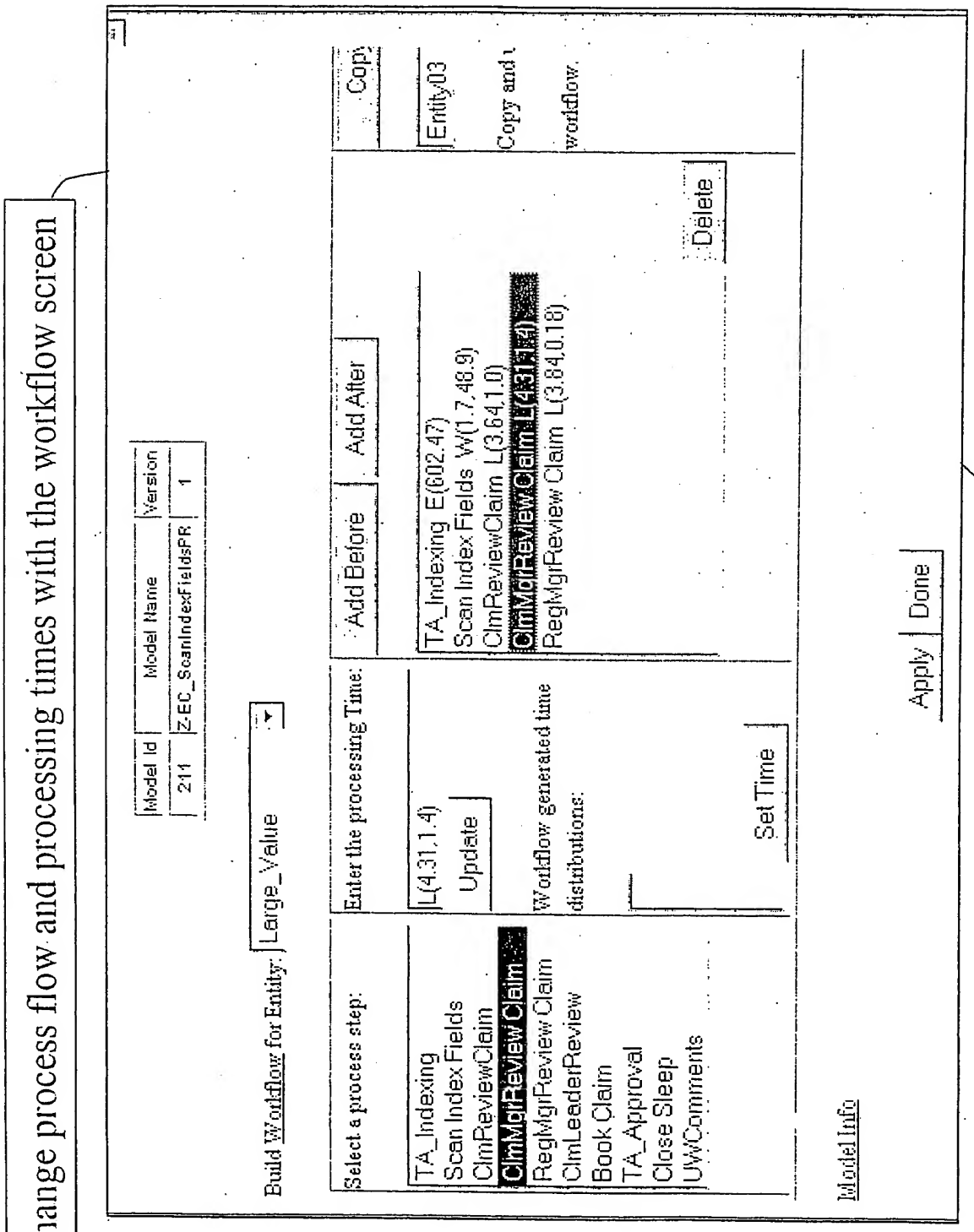
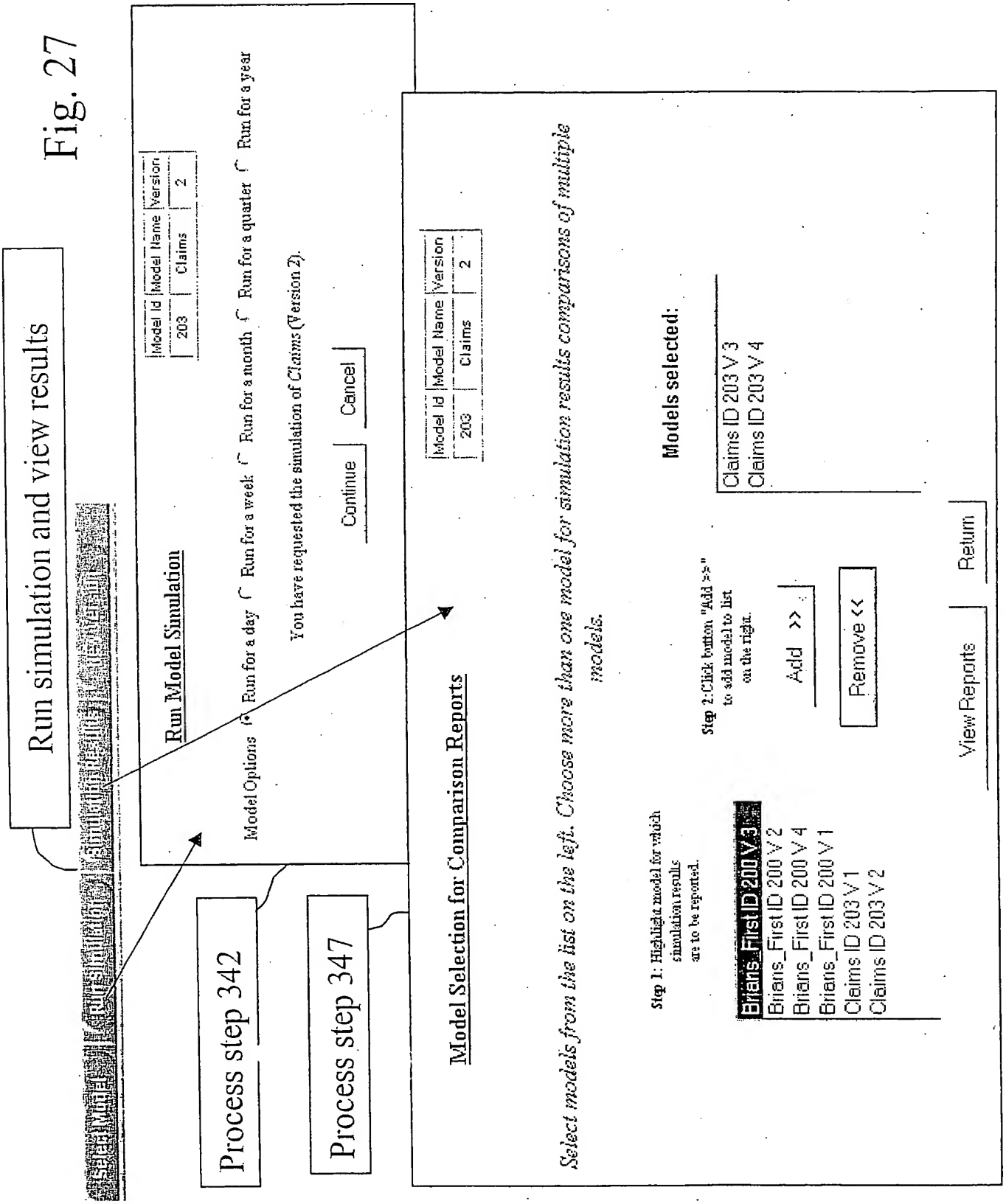

Change process flow and processing times with the workflow screen
Model Id
Model Name
Version
211
Z-EC_ScanIndexFieldsPR
1
Build Workflow for Entity:
Large_Value
Select a process step:
TA_Indexing
Scan Index Fields
ClmReviewClaim
ClmMgrReview Claim
RegMgrReview Claim
ClmLeaderReview
Book Claim
TA_Approval
Close Sleep
UwComments
Enter the processing Time:
L(4.31,1.4)
Update
Workflow generated time distributions:
Set Time
Add Before
Add After
TA_Indexing E(602.47)
Scan Index Fields W(1.7,48.9)
ClmReviewClaim L(3.64,1.0)
ClmMgrReview Claim L(431.82)
RegMgrReview Claim L(3.84,0.18)
Delete
Cop
Entity.03
Copy and
workflow.
Model Info
Apply
Done
Process step 336

Fig. 26

Fig. 27


Run simulation and view results
Process step 342
Process step 347
Run Model Simulation
Model Id | Model Name | Version
203 | Claims | 2
Model Options
Run for a day
Run for a week
Run for a month
Run for a quarter
Run for a year
You have requested the simulation of Claims (Version 2).
Continue
Cancel
Model Selection for Comparison Reports
Model Id | Model Name | Version
203 | Claims | 2
Select models from the list on the left. Choose more than one model for simulation results comparisons of multiple models.
Step 1: Highlight model for which simulation results are to be reported.
Step 2: Click button "Add >>" to add model to list on the right.
Brians_First ID 200 V 3
Brians_First ID 200 V 2
Brians_First ID 200 V 4
Brians_First ID 200 V 1
Claims ID 203 V 1
Claims ID 203 V 2
Add >>
Remove <<
Models selected:
Claims ID 203 V 3
Claims ID 203 V 4
View Reports
Return

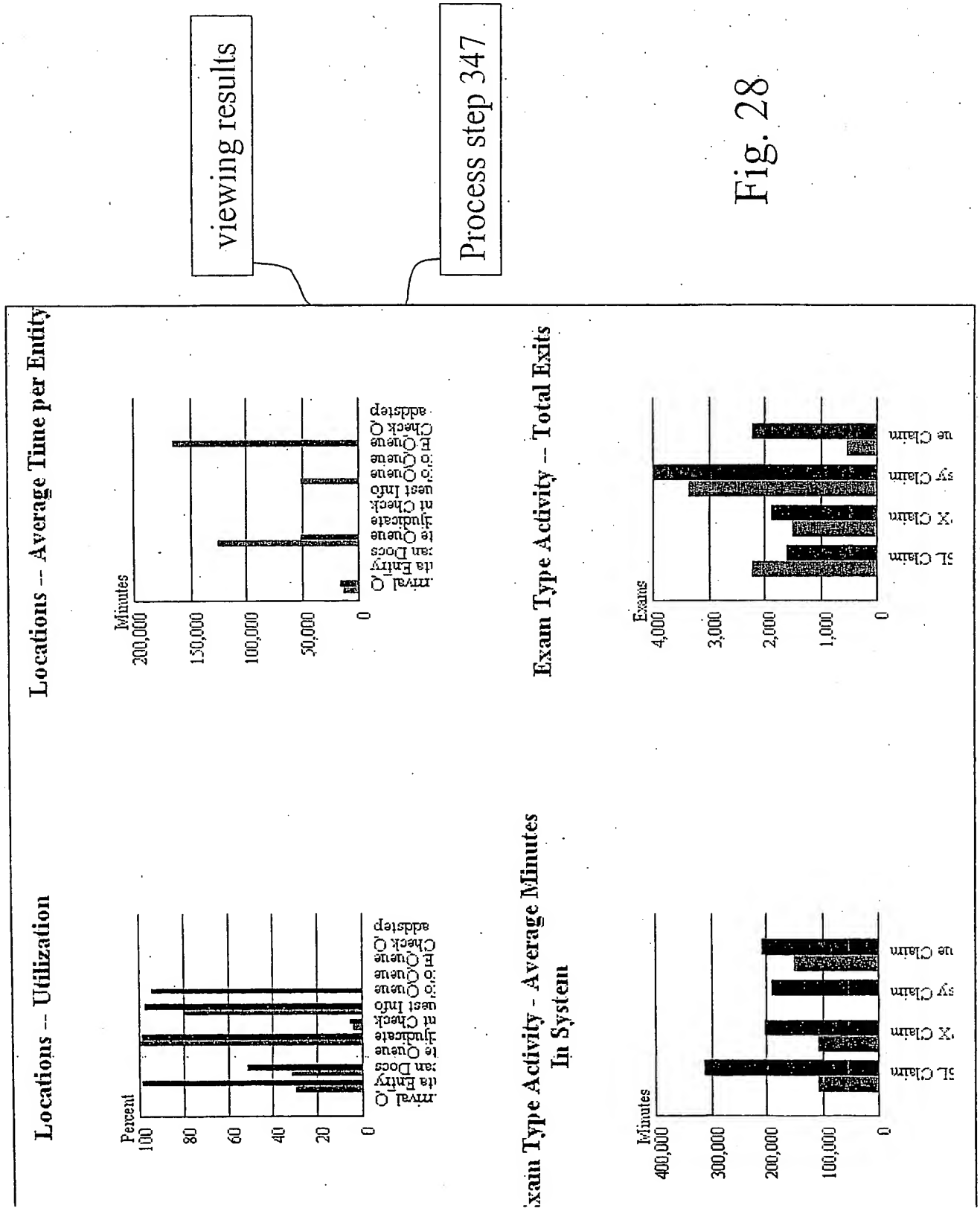

viewing results
Process step 347
Locations -- Average Time per Entity
Minutes
200,000
150,000
100,000
50,000
0
rrival Q
da Entry
:an Docs
te Queue
djudicate
nt Check
uest Info
o Queue
E Queue
Check Q
addstep
Locations -- Utilization
Percent
100
80
60
40
20
0
Exam Type Activity -- Total Exits
Exams
4,000
3,000
2,000
1,000
0
sL Claim
X Claim
sy Claim
ue Claim
Exam Type Activity - Average Minutes In System
Minutes
400,000
300,000
200,000
100,000
0
sL Claim
X Claim
sy Claim
ue Claim

Fig. 28

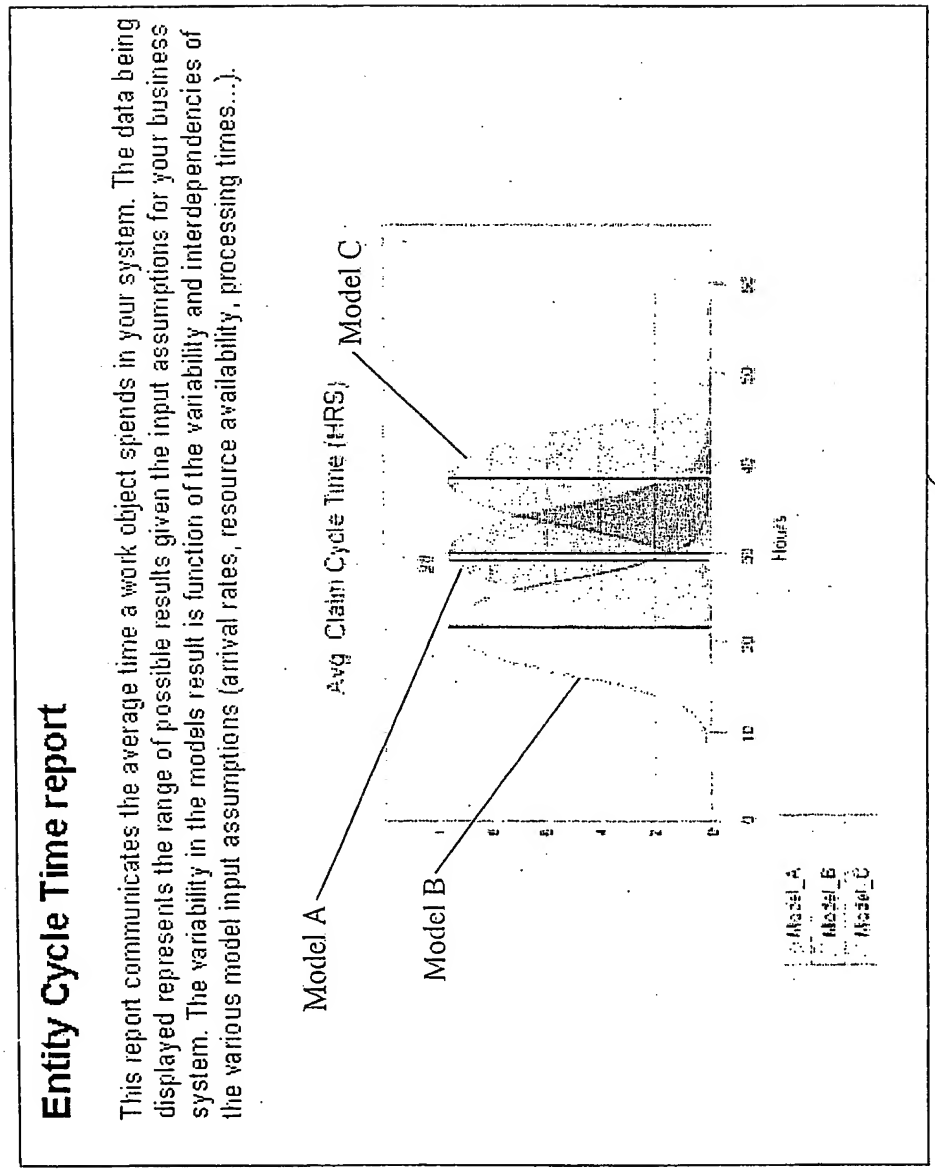

Entity Cycle Time report
This report communicates the average time a work object spends in your system. The data being displayed represents the range of possible results given the input assumptions for your business system. The variability in the models result is function of the variability and interdependencies of the various model input assumptions (arrival rates, resource availability, processing times...).
Model A
Avg. Claim Cycle Time (HRS)
Model C
Model B
Hours
Model_A
Model_B
Model_C
Process step 347

Fig. 29

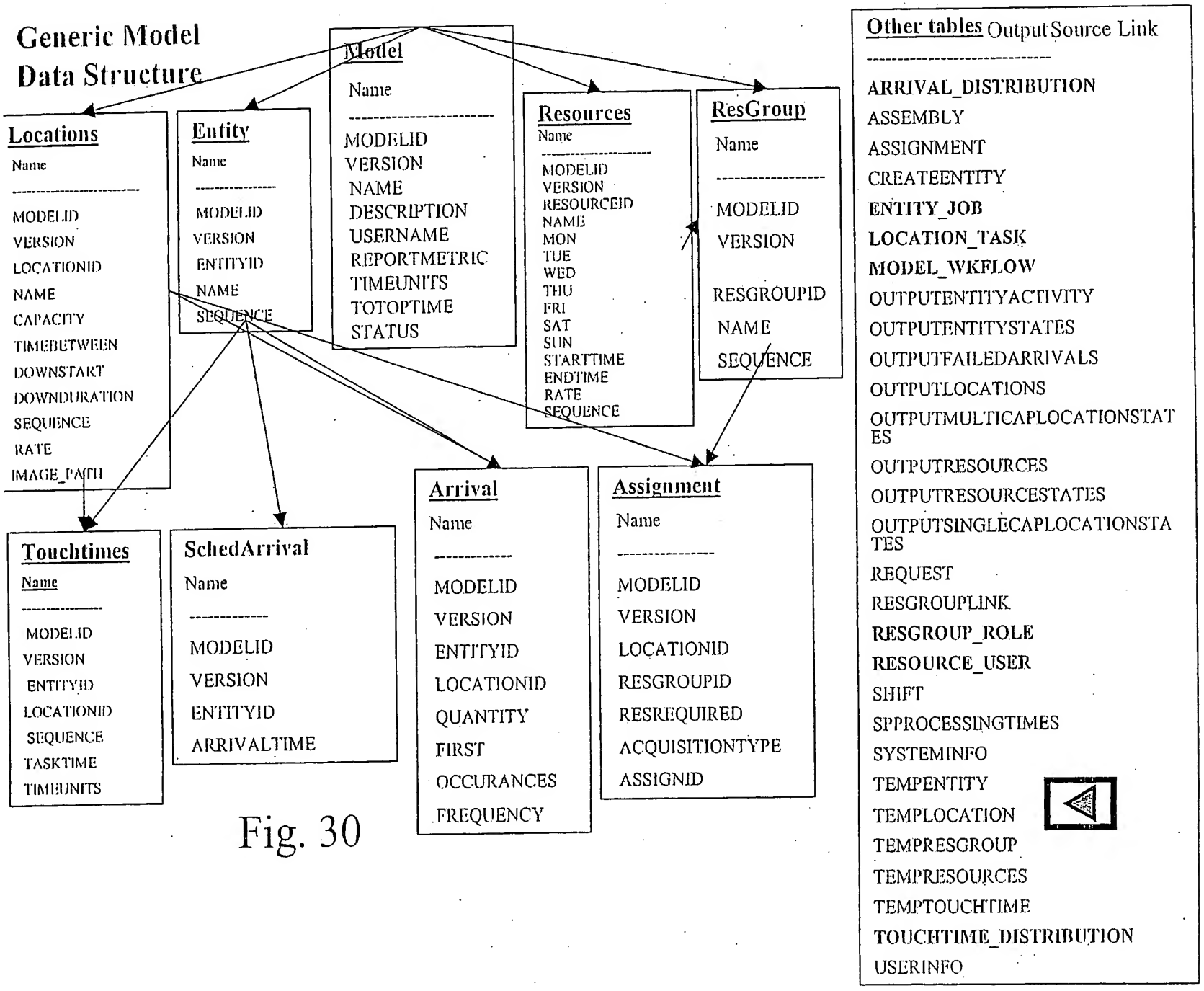

Generic Model
Data Structure
Model
Name
MODELID
VERSION
NAME
DESCRIPTION
USERNAME
REPORTMETRIC
TIMEUNITS
TOTOPTIME
STATUS
Locations
Name
MODELID
VERSION
LOCATIONID
NAME
CAPACITY
TIMEBETWEEN
DOWNSTART
DOWNDURATION
SEQUENCE
RATE
IMAGE_PATH
Entity
Name
MODELID
VERSION
ENTITYID
NAME
SEQUENCE
Resources
Name
MODELID
VERSION
RESOURCEID
NAME
MON
TUE
WED
THU
FRI
SAT
SUN
STARTTIME
ENDTIME
RATE
SEQUENCE
ResGroup
Name
MODELID
VERSION
RESGROUPID
NAME
SEQUENCE
Other tables Output Source Link
ARRIVAL_DISTRIBUTION
ASSEMBLY
ASSIGNMENT
CREATEENTITY
ENTITY_JOB
LOCATION_TASK
MODEL_WKFLOW
OUTPUTENTITYACTIVITY
OUTPUTENTITYSTATES
OUTPUTFAILEDARRIVALS
OUTPUTLOCATIONS
OUTPUTMULTICAPLOCATIONSTATES
OUTPUTRESOURCES
OUTPUTRESOURCESTATES
OUTPUTSINGLECAPLOCATIONSTATES
REQUEST
RESGROUPLINK
RESGROUP_ROLE
RESOURCE_USER
SHIFT
SPPROCESSINGTIMES
SYSTEMINFO
TEMPENTITY
TEMPLOCATION
TEMPRESGROUP
TEMPRESOURCES
TEMPTOUCHTIME
TOUCHTIME_DISTRIBUTION
USERINFO
Touchtimes
Name
MODELID
VERSION
ENTITYID
LOCATIONID
SEQUENCE
TASKTIME
TIMEUNITS
SchedArrival
Name
MODELID
VERSION
ENTITYID
ARRIVALTIME
Arrival
Name
MODELID
VERSION
ENTITYID
LOCATIONID
QUANTITY
FIRST
OCCURANCES
FREQUENCY
Assignment
Name
MODELID
VERSION
LOCATIONID
RESGROUPID
RESREQUIRED
ACQUISITIONTYPE
ASSIGNID

Fig. 30

FIG. 31A

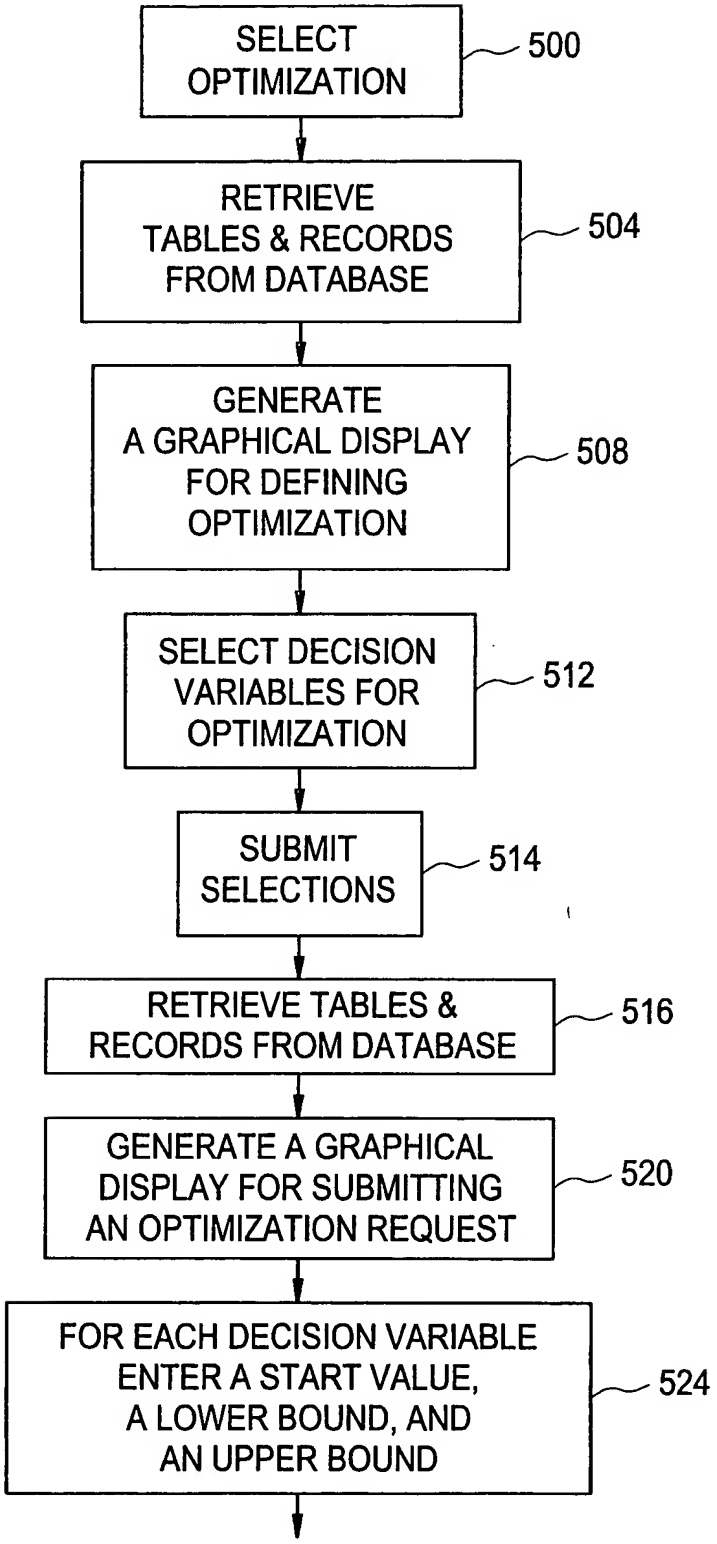

SELECT OPTIMIZATION
500
RETRIEVE TABLES & RECORDS FROM DATABASE
504
GENERATE A GRAPHICAL DISPLAY FOR DEFINING OPTIMIZATION
508
SELECT DECISION VARIABLES FOR OPTIMIZATION
512
SUBMIT SELECTIONS
514
RETRIEVE TABLES & RECORDS FROM DATABASE
516
GENERATE A GRAPHICAL DISPLAY FOR SUBMITTING AN OPTIMIZATION REQUEST
520
FOR EACH DECISION VARIABLE ENTER A START VALUE, A LOWER BOUND, AND AN UPPER BOUND
524

FIG. 31B

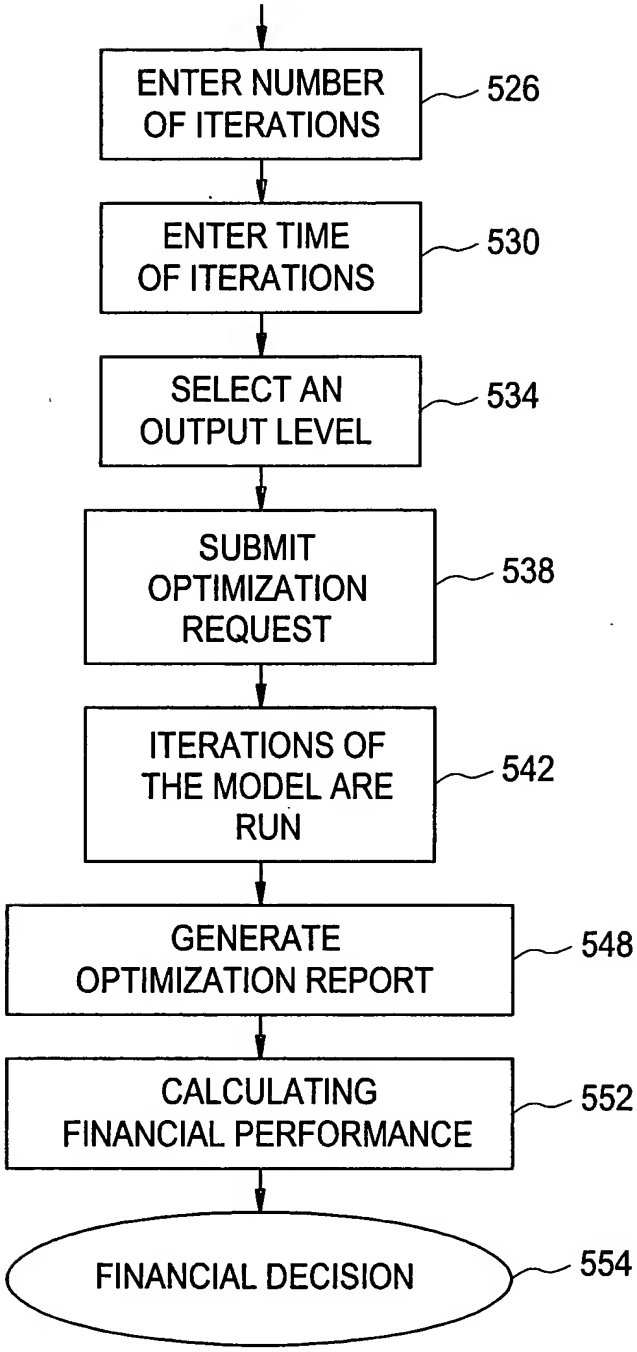

ENTER NUMBER OF ITERATIONS
526
ENTER TIME OF ITERATIONS
530
SELECT AN OUTPUT LEVEL
534
SUBMIT OPTIMIZATION REQUEST
538
ITERATIONS OF THE MODEL ARE RUN
542
GENERATE OPTIMIZATION REPORT
548
CALCULATING FINANCIAL PERFORMANCE
552
FINANCIAL DECISION
554

FIG. 32

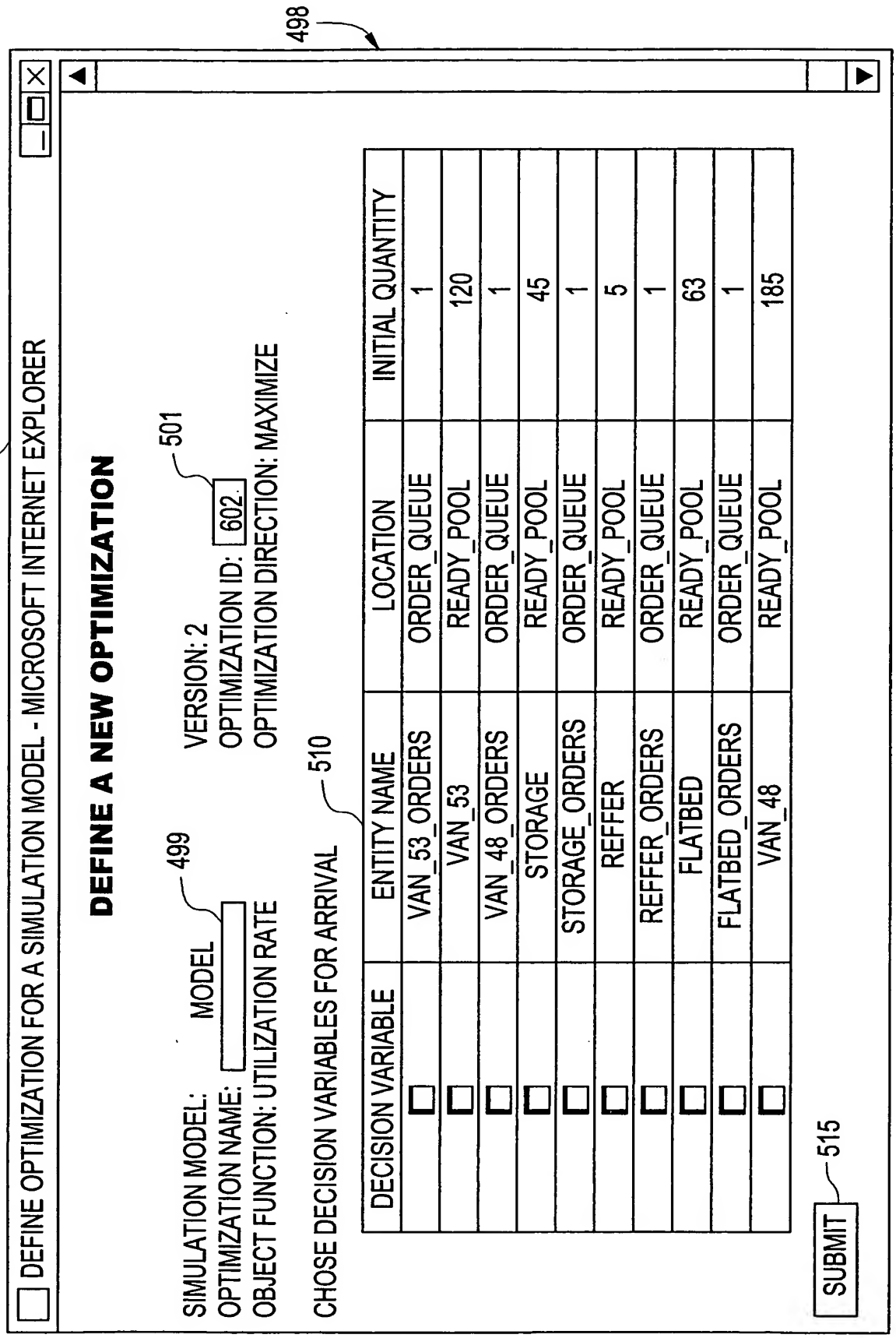

DEFINE OPTIMIZATION FOR A SIMULATION MODEL - MICROSOFT INTERNET EXPLORER
PROCESS STEPS 512, 514
498
DEFINE A NEW OPTIMIZATION
SIMULATION MODEL:
MODEL
499
VERSION: 2
501
OPTIMIZATION NAME:
OPTIMIZATION ID: 602
OBJECT FUNCTION: UTILIZATION RATE
OPTIMIZATION DIRECTION: MAXIMIZE
CHOSE DECISION VARIABLES FOR ARRIVAL
510
DECISION VARIABLE
ENTITY NAME
LOCATION
INITIAL QUANTITY
VAN_53_ORDERS
ORDER_QUEUE
1
VAN_53
READY_POOL
120
VAN_48_ORDERS
ORDER_QUEUE
1
STORAGE
READY_POOL
45
STORAGE_ORDERS
ORDER_QUEUE
1
REFFER
READY_POOL
5
REFFER_ORDERS
ORDER_QUEUE
1
FLATBED
READY_POOL
63
FLATBED_ORDERS
ORDER_QUEUE
1
VAN_48
READY_POOL
185
SUBMIT
515

FIG. 33

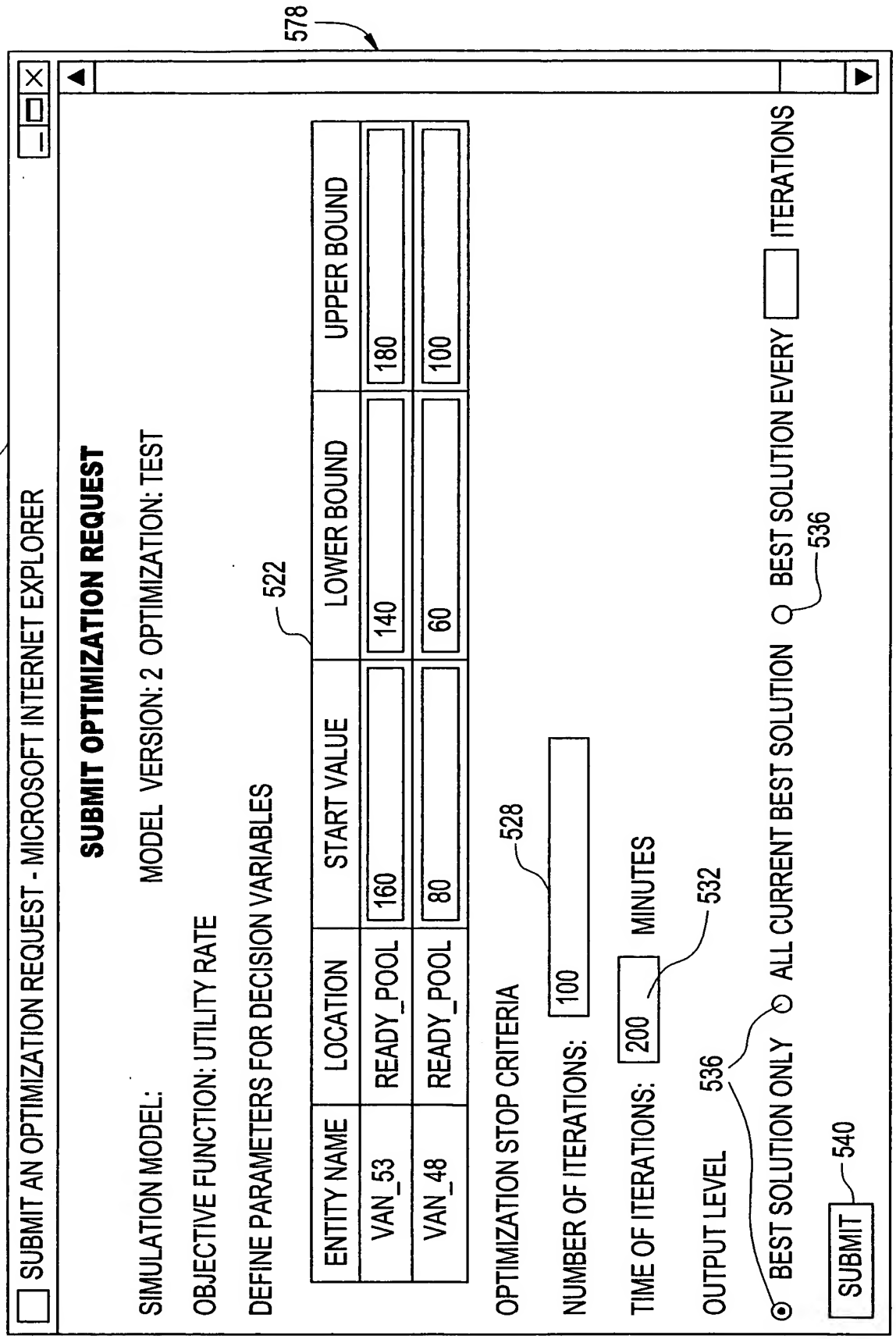

PROCESS STEPS 524, 526, 530, 534
578
SUBMIT AN OPTIMIZATION REQUEST - MICROSOFT INTERNET EXPLORER
SUBMIT OPTIMIZATION REQUEST
SIMULATION MODEL:
MODEL VERSION: 2 OPTIMIZATION: TEST
OBJECTIVE FUNCTION: UTILITY RATE
DEFINE PARAMETERS FOR DECISION VARIABLES
522
ENTITY NAME
LOCATION
START VALUE
LOWER BOUND
UPPER BOUND
VAN_53
READY_POOL
160
140
180
VAN_48
READY_POOL
80
60
100
OPTIMIZATION STOP CRITERIA
528
NUMBER OF ITERATIONS: 100
TIME OF ITERATIONS: 200 MINUTES
532
OUTPUT LEVEL
536
BEST SOLUTION ONLY
ALL CURRENT BEST SOLUTION
BEST SOLUTION EVERY
ITERATIONS
536
SUBMIT
540

FIG. 34

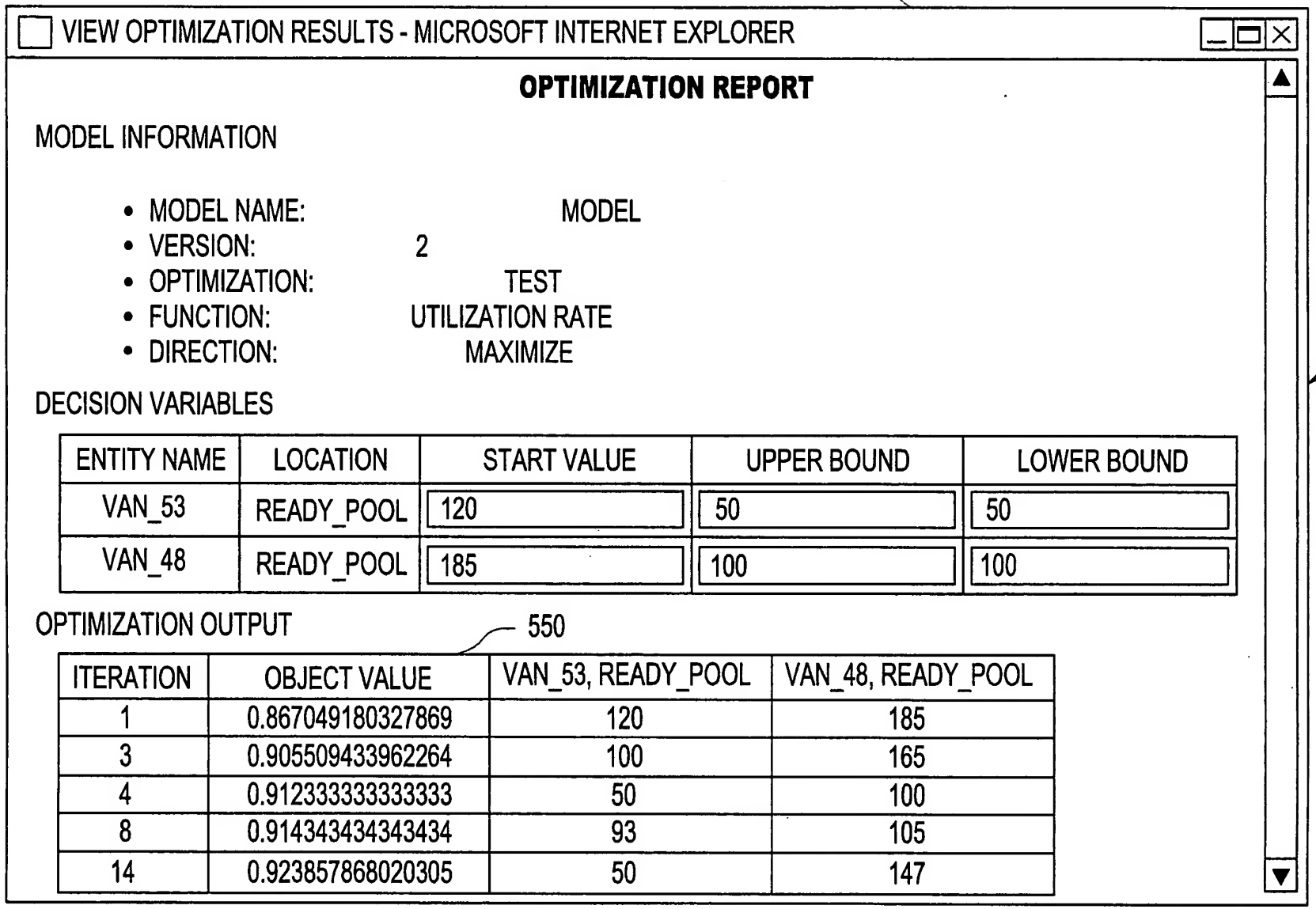

PROCESS STEP 548
VIEW OPTIMIZATION RESULTS - MICROSOFT INTERNET EXPLORER
OPTIMIZATION REPORT
MODEL INFORMATION
• MODEL NAME: MODEL
• VERSION: 2
• OPTIMIZATION: TEST
• FUNCTION: UTILIZATION RATE
• DIRECTION: MAXIMIZE
DECISION VARIABLES
ENTITY NAME | LOCATION | START VALUE | UPPER BOUND | LOWER BOUND
VAN_53 | READY_POOL | 120 | 50 | 50
VAN_48 | READY_POOL | 185 | 100 | 100
OPTIMIZATION OUTPUT
550
ITERATION | OBJECT VALUE | VAN_53, READY_POOL | VAN_48, READY_POOL
1 | 0.867049180327869 | 120 | 185
3 | 0.905509433962264 | 100 | 165
4 | 0.912333333333333 | 50 | 100
8 | 0.914343434343434 | 93 | 105
14 | 0.923857868020305 | 50 | 147
546

FIG. 35

PROCESS STEP 552

53" VAN	48" VAN	UTILIZATION	AVERAGE UNITS OUT ON RENT	TOTAL RENTAL DAYS A YEAR (365 DAYS)	REVENUE FROM RENTAL DAY ($15)	COST ASSOCIATED WITH CHANGES IN PORTFOLIO, MAINTENENACE?	NET UNIT DELTA	REVENUE CHANGE
120	185	0.867	264.435	96518.775	$1,447,782		305	$1,447,782
113	163	0.889	245.364	89557.86	$1,343,368		-29	($104,414)
50	100	0.912	136.8	49932	$748,980		-155	($698,802)
60	167	0.917	208.159	75978.035	$1,139,671		-78	($308,111)
55	134	0.922	174.258	63604.17	$954,063		-116	($493,719)